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# **China Report**

**SCIENCE AND TECHNOLOGY**



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21 November 1984

# CHINA REPORT

## SCIENCE AND TECHNOLOGY

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## NATIONAL DEVELOPMENTS

### 'SCIENTIFIC PRODUCTION BODY' DEFINED, PRIMARY TASKS OUTLINED

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 3, 12 Mar 84 pp 2-5

[Article by Chen Chuansheng [7115 1557 3932] and Ma Aiye [7456 1947 2814] of the Shanxi Provincial Office of Machine-Building Industry, edited by Fu Li [2105 3680]: "A Discussion on Our National Scientific Production Body"--Chen Chuangsheng was born in 1949 and graduated from Xi'an Jiaotong University in 1975. He works at the machinery company under the Shanxi Provincial Office of Machine-Building Industry and also serves as an office director and assistant engineer at the Shanxi Welding Material Teaching, Scientific Research and Production Body. Theses jointly written by him and other comrades include "The Discussion of Boiler Expansion Tube Stress Test and Tube Welding Techniques" ["Industrial Boiler Newsletter" 1982, 4] and "A Trial Talk on the Legal Characteristics of the Scientific Production Body" [Shanxi University Newspaper, 1984, 1]. Ma Aiye was born in 1934 and graduated from the college department of the Tenth Aviation School in 1960. He works at the machinery company under the Shanxi Provincial Office of the Machine-Building Industry and serves as head of the leading group and as engineer at the Shanxi Provincial Welding Material Teaching, Scientific Research and Production Body.]

[Text] In the present economic reform, enterprise restructuring and integration are part of the readjustment and an important measure of the reform. Among the forms of enterprise restructuring and integration is the scientific production body organized and established in accordance with scientific principle. This article plans to make a preliminary probe of issues concerning the form of organizations, functions and tasks of China's scientific production bodies and conditions for establishing such bodies.

#### I. The Scientific Production Body--A New Alliance

Marxists contend: "The process of developing the mode of social production from a primitive form to a sophisticated form is also a process of constantly accumulating human experiences in production, a process of constantly increasing the depth and breadth of scientific and technological

knowledge and a process of constantly expanding the use of such knowledge in production." (A Dictionary of Politics and Economics, p 81). Obviously, with society progressing, the relation between science and technology and production will inevitably grow closer daily. Science and technology have infiltrated the whole process of production and have become an important condition on which the existence and development of the modern world depends. Problems arising in modern production have in turn hastened the development of science and technology.

Due to the tendency of the predominantly comprehensive development of modern science and technology, many major fields of modern scientific and technical studies and projects have involved more and more specialized subjects. To adapt to this situation, multiple-science coordination has begun to flourish. With the scientific research ability of the whole society constantly increasing, the scale of the coordination has also developed from collective to national and to gigantic international research scales. Moreover, due to technological progress, the process of transferring scientific research results to technology has been hastened substantially. For example, in the past few years, 50 percent of the technology of the electronics industry has become outdated and obsolete. Compelled by this situation, scientific production bodies first began to develop in some developed countries. Scientific production bodies were "suggested as a brand new form of systematic and comprehensive management of scientific and technical progress. This form is determined when the technical specialization of separate individual systems (S&T institutes and enterprises) is transferred to the subject specialization carried out within the scope of unified institutes (systems) to solve S&T problems in a comprehensive manner." ("Scientific Production Body," p 27, written by Ji Yi Takexier [1015 0122 1044 0344 6007 1422], Russian.) This is an advanced form of organization which organically combines science and technology with production. It is a new economic system of modern society. Some scholars call it "a new alliance."

## II. Characteristics and Forms of Organization of the Scientific Production Body

The first organizational characteristic of the scientific production body, different from ordinary specialized companies, is that the main component of a scientific production body is a scientific research organization which also exercises a certain degree of leadership at various levels. In some scientific production bodies, leaders of scientific research institutes even serve concurrently as principal leaders of the bodies. No matter whether the main component is a research institute, design institute, technical institute or a university, the development and application of scientific research results in production must be considered the primary task of the scientific production body.

The second organizational characteristic of scientific production bodies is that the bodies include organizations needed for every link from theoretical research to application in production. Some also include the link of teaching, forming a comprehensive body of scientific education, production techniques and business management.

Since different trades have different technical characteristics and different cities have different economic conditions, China's scientific production bodies take multifarious forms. Based on their organizational characteristics, they can be classified into the following three types:

#### A. Loosely-Structured Type of Scientific Production Body

Many of our scientific production bodies are this type. They are generally formed by universities, scientific research organizations and various enterprises on the basis that they have established the relation of steady, long-term and comprehensive scientific and technical coordination. Generally, there are no special administrative arrangements. Instead, the departments concerned (such as S&T commissions), together with representatives of member units, form boards of directors or coordination committees to coordinate work in all fields according to contracts. This type of scientific production body is not a legal corporation. The affiliation relations of member units remain unchanged. They remain legally independent. They can join several scientific production bodies according to their needs. The scientific research-oriented organizations play an important role in scientific production bodies by relying on advanced technology to give technical instructions to enterprises and serving as enterprise strategy and technology development centers as well as intellectual exploitation centers.

#### B. Semi-Entity Type of Scientific Production Body

This type of scientific production body has special administrative organs and entities to support it and represents its various comprehensive interests. The permanent organizations of such bodies have their own, independent properties which are separate from those of member units. Therefore, they are qualified as legal corporations. Some of their member units are legally independent, and some are not. This type of scientific production body relies mainly on technical instructions instead of unified organizations to exercise leadership over its members. Since its leading bodies include the representatives from departments in charge of enterprises, this type of scientific production body is able to exercise administrative intervention to a certain degree. We call them semi-entity type scientific production bodies because their organizational form is a cross between the loosely-structured type and the entity type of scientific production body.

### C. Entity-Type Scientific Production Body

This type of scientific production body is an integrated enterprise formed by several scientific research organs, enterprises and production units or universities. The main characteristic that distinguishes this type of scientific production body from general trust companies and integrated enterprises is that instead of major enterprises, scientific research-oriented enterprises or institutions exercise the function of the principal organs in the bodies. In other words, the administrative organs of scientific research institutes serve concurrently as administrative organs of the integrated companies. We call these scientific production bodies entity-type scientific production bodies.

Other forms of integration between scientific research and production in our country are industrial technology development centers established on the basis of comprehensive scientific research institutes and functioning as technical leaders of departments and industries. There are also comprehensive technology department centers such as the technology development center of the Beijing Engineering University. These forms of organizations have played a very good role in closely combining scientific research with production. But they are not scientific production bodies, because they do not include all links in the entire research-production cycle. Large-scale trust companies organized by large and medium-sized key enterprises and other integrated enterprises are not the kind of scientific production bodies we are going to discuss here because their main components are large key enterprises, not scientific research institutes.

### III. Functions and Tasks of a Scientific Production Body

Scientific production bodies are integrated technical and economic organizations established to manage scientific and technical progress in a systematic and comprehensive manner. They play an important role in scientific and technical progress and construction of the national economy.

#### A. Shorten the transfer period of research results and increase enterprises' ability to handle emergency market situations.

Since technology is now updated in a shorter period, new technology will soon become obsolete. Therefore, reducing the time needed to adopt new technology is extremely important. Scientific production bodies have merged science and production into an organic whole. Therefore, research units should give priority to making arrangements for the key research projects urgently needed in enterprises and give full consideration to the conditions required for enterprises to actually utilize such projects. Enterprises should provide conditions for expanding the experiments and do a good job in making advanced preparations for transferring research results into production. By doing so, they can reduce the time needed to transfer scientific research results from laboratories to factories and increase the utilization rate of scientific research results.

B. Create good-quality products and increase enterprises' ability to compete.

Since scientific production bodies have all the links in the research-production cycle, it is possible for them to organize a strict and effective quality control system and create good-quality products. In the past, it was also possible for scientific research units to create scientific research results of advanced levels. But due to a lack of organic links in organizations, it was difficult for these results to become popular-brand products in research units. They remained in the stage of "samples, exhibits and gifts." After the establishment of scientific production bodies, the previous simple relation of coordination between research and production units has changed into the relation of responsibility between "technical centers" and production departments. Research units give enterprises not only technical instructions but also necessary help in enterprise management. They guarantee the quality of new products in the field of design, technology and production so as to protect the credit of scientific research results.

C. Hasten the technological progress in sectors and industries and bring into play their important role.

Scientific production bodies gather a number of influential experts and scholars from sectors or industries and use authoritative research institutes as their support. Therefore, they can serve as scientific and technical centers for sectors or industries and play an important role in technological progress.

D. Serve as modern science and technology training schools.

Scientific production bodies organically combine the engineers and technicians of scientific research organs and production units, and bring about the integration of talents to a certain degree. In the activities of scientific production bodies, the labor of engineers and technicians has the characteristic of scientific labor which arouses their initiative in work. Practice proves that the results of such collective labor are much greater than the simple sum of individual labor results without integration. At the same time, the continuous application of new technology further stimulates plant managers and workers to study and therefore raises the managerial level of enterprises. In addition to other ways of learning, scientific production bodies actively create conditions for training specialists in order to build step by step a technical contingent that has a galaxy of talents and great strength. Because of this, the people call scientific production bodies "modern science and technology training schools."

**E. Serve as an effective form of organizational management in multiple-subject technology coordination.**

In scientific production bodies, scientific research organs use technical instructions as a supplement to the production command system of production units and use advanced technology to accelerate the division of labor and development of enterprises. Scientific production bodies organize the integration of multiple-level "production factors" between research organs and enterprises and between different enterprises, namely--the integration of technology, competent personnel and equipment. They use the salient features and conditions of all fields to develop and manufacture advanced products.

Some scientific production bodies also include the integration of units in the coastal and inland areas, and the integration of military and civilian enterprises. This can effectively promote the transfer of science and technology from coastal to inland areas and the transfer of pure military uses to civilian uses. For example, a transregional and interdepartment integrated body currently organized in China based on the field of extra-large-scale integrated circuits is playing this very role.

In sum, relying on technical progress, scientific production bodies are playing an important role in the national economy.

Obviously, because they rely on technical progress, they certainly help enterprises achieve marked economic results. But merely using economic results to evaluate the role of scientific production bodies is not enough. Some foreign scholars contend "it is better to use the target of raising the technical level of a certain department with the research results of scientific production bodies as a criterion for the evaluation." This includes the various influences of scientific production bodies on production techniques and economic levels of sectors and industries. Some of these influences are very difficult to be measured by "value targets," such as the rational utilization of competent personnel in scientific production bodies. Therefore, how to comprehensively and accurately evaluate the role of scientific production bodies needs further study and discussion.

Based on different sectors and industries, the tasks of scientific production bodies have different emphases. However, their major tasks are:

1. Accelerate the scientific and technical progress of sectors (industries) on the basis of using the latest research results.
2. Create and use new machinery, instruments, equipment, materials, techniques and automatic control systems in production.
3. Rapidly organize the mass production of research results in enterprises and take responsibility for installing and testing new products or equipment.

4. Provide forecasts on technical levels aimed at improving product quality and devise plans to solve major scientific and technical problems.
5. Provide necessary aid to help enterprise cadres, workers and technical personnel to master new technology and research results at a quicker speed.
6. Serve as information centers to provide timely and comprehensive reports on the newest achievements of a certain sector or industry on products and technology, and unclog the information channels between markets and enterprises to promote the continuous improvement and updating of products.
7. Guarantee that they fulfill their plans and tasks according to contracts, tap maximum potential, carry out intensive production, increase labor productivity and research efficiency of all staff and members, utilize raw materials in a comprehensive manner, economize on energy resources, reduce production costs of products and improve enterprise economic results.

#### IV. Actively Create Conditions for Development of Scientific Production Bodies

Scientific production bodies are an important form of organization for the expansion of production based on internal conditions for enterprises in our country. We should bring into full play the superiority of our socialist system, choose those enterprises and design departments with conditions and organize them into entity-type or semi-entity-type scientific production bodies around certain scientific research groups to serve as key integrated enterprises for their own departments or industries. We can also organize them into wide-range scientific parks, namely, loosely-structured type of scientific production bodies, around certain major scientific research projects or major economic construction projects.

In addition to improving the ideological understanding of leaders at all levels, four conditions are required for the organization of scientific production bodies:

1. Enterprises should practice strict economic responsibility systems. Principal enterprise leaders should be concerned with technical progress, which is the most important condition for organizing scientific production bodies.
2. Scientific production bodies should have competent S&T personnel of a fairly high level and academic leaders who have a fairly strong organizing ability to form authoritative groups of technology. They should also have relatively abundant technology reserves and conditions for carrying out experiments.

3. Departments concerned at higher levels should give active guidance. At present, many scientific research institutes and production units urgently need to be integrated. But due to a lack of "matchmakers," those departments with conditions have not yet been organized. Therefore, economic commissions and S&T committees at all levels should jointly establish a special organizing institution to lead the organization and establishment of scientific production bodies in light of the transformation of enterprises and reform of scientific research systems. Departments in charge should also select and assign enthusiastic cadres who have a fairly high ideological level and organizing ability to participate in the leading work of scientific production bodies to strengthen the coordination and organization of day-to-day work and do a good job in the political and ideological work of all fields.

4. Scientific production bodies should have rules for all departments to abide by and detailed regulations of management. They should adhere to the principles of equality and mutual benefits in economic activities, do things strictly according to contracts and display good style in confronting problems. Moreover, pertinent state departments must also formulate a number of economic policies conducive to the development of scientific production bodies. For example, financial and credit policies should support the popularization and utilization of new technology and products; tax policies should encourage technical progress and price policies should implement the principle of setting higher prices for higher quality. Contradictions between scientific production bodies and present systems should be actively solved with the spirit of reform. When proper, the NPC Standing Committee should also consider formulating and promulgating our national "Rules and Regulations for Scientific Production Bodies" and use them to accelerate the development of scientific production bodies.

As an advanced form of organization, the superiority of scientific production bodies is beyond dispute. However, problems will arise if some relations are improperly handled. A recent article (29 October 1982) in the U.S. Christian Science Monitor states that in the cooperation with enterprises, universities should pay attention to avoiding such problems as hindering scientific development, undermining teaching quality, reducing the functions of universities as academic institutions and interfering in the selection of scientific research subjects and diverting the energies of teaching personnel. However, these problems can be easily solved under our socialist system.

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## NATIONAL DEVELOPMENTS

### IMPORTANCE OF PATENT SYSTEM TO CHINESE TECHNICAL MARKET

Tianjin KEXUEXUE YU KEXUE JISHU GUANLI [SCIENTIOLOGY AND MANAGEMENT OF SCIENCE AND TECHNOLOGY] in Chinese No 4, 12 Apr 84 pp 5-8

[Article by He Runhua [0149 3387 5478] of the Tianjin Municipality Research Committee for Industrial Property Rights and Technology Transfer: "Theory and Practice Regarding Our Technical Market and Patent System, Written on Behalf of the Publication of our First Patent Law"]

#### [Text] I. A Theory Concerning the Technical Market

##### A. The Role of Technology in the Commodity Economy

Technology has a wide-range of meanings. As discussed in this article, technology lies within the domain of technology transfer. Since technology has become the symbol of certain commercial behavior, it must have an independent expression. As a result, in the context of technology transfer, "technology" means the system of knowledge needed to manufacture certain products, to use certain production methods (tools or techniques), and to provide certain services. This system of knowledge can be expressed through words, diagrams, etc. It does not depend upon individual physiological characteristics, and it can be imparted to others.

A commodity economy is an economic formation in which production is the result of the exchange of the products of labor, and in which all production departments are connected by the exchange of commodities.

The products of labor are the result of the labor process. The basic elements of the labor process are<sup>1</sup> (1) the activity with a purpose, or labor itself; (2) the means of labor; and (3) the object of labor. Technology is not "the activity with a purpose or labor itself", it is not "the object of labor" (in terms of the production of physical goods).<sup>2</sup> Technology is an element of the means of labor; it is a component of the means of labor and may be called the material form of the means of labor. Technology is the crystallization of human creativity. It plays a dynamic role in the transformation of the material form of the means of labor, and the means of labor is an instrument for measuring the strength of human labor development.<sup>3</sup>

When the products of labor become commodities, they take on the dual characteristics of value and use/value. In the process of commodities exchange, use/value bears the weight of value. If the use/value does not change, the value will change according to the change of the means of labor.<sup>4</sup> To be more precise, advanced technology will shorten the labor time society requires, and the value will thus be lowered. If exchange rates remain unchanged, the lower value brought about by the advanced technology of one side will replace the higher value of the other side. As a result, during the exchange of different products, the role of advanced technology is to move the labor from one side to the other, so one side will become richer and the other side poorer.

Society has a limited demand for any kind of labor product. This is called market capacity. In fact, when the total output for the same kind of product produced by different makers is above the market capacity, fierce competition to sell products at reduced prices results, and low-priced products of good quality win. The labor of the defeated products loss its value and becomes useless. Because of this, in a commodity economy, to grasp and to control advanced technology is of vital importance to every manufacturer.

#### B. Objective Requirements for Forming a Technical Market

First, technology develops when the domain of production expands continuously. The expansion of the Production domain is also an expression of the expansion of the social division of labor. Technology is also divided into various categories, and the development of technology itself depends on exchange among these categories and using their experience for reference. In a commodity economy, technology is exchanged in the form of commodities thus achieving technological exchange and experience. Therefore, the opening up of a technical market is an objective requirement for technology itself.

Second, the systemization of modern scientific and technical knowledge enables new technologies to be free of the dependence upon an individual's physiological characteristics and it enables new technologies to emerge in large numbers. The intensification of the division of labor leads to the birth of professions that are geared towards new technology production research. If producers of technological products want to realize the value of their own labor, they should offer the product of their own labor--new technology.

Third, the chaning international political environment leads to the development of an international technical market. The political independence of a country rests upon its economic independence, and its economic independence rests upon technological advances. In order to resist economic plunder in the form of commodity exchange, economically underdeveloped countries employ thetechnique of limiting the importation of commodities while expanding the importation of technology so that they can improve their economic structure and power.

### C. The Dual Characteristics of Technology as a Commodity

Technology is a non-physical form of commodity. It has two distinguishable characteristics. On the one hand, as a certain system of knowledge, technology can be reproduced without limit and will not suffer physical damage. On the other hand, the development of technology is the accumulation of knowledge. Because there is a gap of knowledge between the technologically advanced and the technically underdeveloped, the commodity aspect of any advanced technology contains invisible damage, and the commodity value of technology will gradually be lowered as the use of the technology becomes more popular.

Because technology has dual characteristics as a commodity, it makes two kinds of demands on the technical market. First, because technology does not suffer material loss, it needs only one market capacity. If there is more than one capacity, then there is waste. Furthermore, conflicts in production rights result during the trading of technology. Because of this, there is a problem of protecting technology property rights. There should be compensation for the transfer of technology, not because technology can create a lot of wealth, but because the production of technology can cost a lot of wealth. Every time technology is sold, the sale often includes the invisible loss of value. Therefore there should be compensation for this.

## II. The Technical Market and Reform of the Chinese Economic System

Despite the fact that international trade has developed very rapidly in the last several decades, China did not start developing a technical market until 1979, after the reform of the economic system began to be implemented.

### A. Reform of the Chinese Economic System

During the 30 years before 1979, Chinese economic theory was conservative. It denied the existence within socialist conditions of a commodity economy as part of the realm of the means of production. This theory also affected the realm of the means of production. By following this theory, everyone in the economy "ate out of a common pot". Technology was public-owned and the technology market did not exist.

Since 1979, China has implemented a new economic policy, and there have been two breakthroughs in economic theory. First, the policy acknowledges the existence of a commodity economy under the conditions of socialism. Enterprises owned by the whole people can, as independent, commodity manufacturers, exchange their own commodities. A commodity market exists in China. Means of production and means of livelihood (means of subsistence) can enter the commodity market as labor products.<sup>5</sup> Second, the theory acknowledges that every enterprise owned by the whole people has its own relatively independent economic benefits.

As a result of the workings of market mechanisms and the laws of costs, competition emerged in our economy: "competition presses people to break the habit of sticking to old ways, to work hard for the prosperity of the country, and to compete for progress. Competition is like a school where people learn economic laws and act accordingly. Obviously, the emergence of competition has stimulated our long depressed economic life."<sup>6</sup>

Competition has been the major driving force in the development of capitalistic societies. Understanding competition under the conditions of socialism is the first step that our economic theory has taken in 30 years. Competition is a by-product of the commodity economy. Though the commodity economy began in a feudal society and became highly developed in a capitalistic society, it is not only an economic characteristic of capitalist societies. Competition, therefore, is not monopolized by capitalism; the commodity economy still exists under the conditions of socialism. Competitions bring into play a powerful driving force in the economic development of socialism. Competition under the conditions of socialism is different from that under capitalism because the social institutions of the two systems differ; the competitive rule that "the superior wins and the inferior loses" is always the same among all social systems.

Economic competition, after all, is technological competition. Technology not only brings prosperity to the economy, it is also a driving force in technological development. The inevitable changes in the Chinese economic system are that technology will transform into commodities and that the technology will open markets. The document "Temporary Provisions on the Development and Protection of Socialist Competition"<sup>7</sup> clearly states that the economic benefits of the relevant units and people are protected, and there is enforcement of royalties from patents on important created or discovered technology results.

To develop the economy, the upgrading of the national scientific and technological level has to be promoted. While reforming the economic system, the central government has formulated a policy of scientific and technological development for a new era. It has clearly proposed that science and technology must serve the economy and society, and must integrate with them. It has proposed that technologies should achieve the "Four Transfers", i.e., "advanced technologies are transferred from laboratories to factories, from military use to civilian use, from the coast to the interior, and from outside the nation to within".<sup>8</sup> Payments for technology transfer are the commonest forms of achieving the "Four Transfers". Under such conditions, a technical market has broken ground in the great land of China.

#### B. Chinese and International Technical Markets

Since 1981, organizations specializing in technology trade have been successively started in most provincial capitals, and in some large, medium

and small cities. All kinds of technology trade fairs have been held on over several dozen occasions. Ten to several hundreds of technological trade transactions have taken place. Business volume was over several million yuan. This is our technology market. It keeps in close touch with the international market. For example, in order to strengthen the technological improvement of medium-scale and small-scale enterprises in every area and, in order to promote the technological progress of existing enterprises, the State Economic Commission decided last year that during the last 3 years of the Sixth Five-Year Plan, more than three thousand items of advanced technology will be imported from foreign countries for industries such as textiles, light industry, foodstuffs, packaging, machinery, electronics, precision processing, pharmaceuticals, construction materials, and certain required accessory raw materials and materials.<sup>9</sup>

China has a vast commodity market. In order to protect the development of our industry, we mainly import advanced technology for production use. Because of this, in the long run, China will become a big technological market for many advanced countries. Second, implementing the policy of turning technology into commodities leads to the export of Chinese advanced technology, and our entering the international technology market. During the last 30 years, we copied some foreign advanced technology without paying royalties for their patents. We also contributed our advanced technological skills to the international society without getting royalties for patents. China is a developing country that possesses certain scientific and technological strengths. We export the technologies of the top-burn hot-blast furnace, of hybrid rice, and of sour soy milk to countries like Luxembourg, the United States, and Japan. With the realization of new economic and technological development policies, the development of technology exports will move at a faster pace.

### III. The Chinese Patent System

The domestic and international technical markets require the setting up of a patent system in China.

Technology is a non-physical commodity. In the domestic technology trade, technology owners face the same problem in the technical market faced by members of the same professions of all countries. Without a patent system, the property rights to technological inventions cannot be recognized and protected. When an invention is made known to the general public, the invention loses its value.<sup>10</sup> Sole property rights cannot be acknowledged without a patent system,<sup>11</sup> neither can the orderliness needed by the technical market be protected. Without a patent system, the first thing that technologies transformed into commodities bring about is a technological blockade, and royalties for technology patents alone cannot break the blockade.<sup>12</sup> Because these things can happen, the setting up of a patent system under our economic reforms can launch technological exchanges and can accelerate the need for scientific and technological development.

In terms of international technology trade, our open-door policy is a long-term policy. The patent system is a tool for international and economic

exchanges. Our country has stipulated that a patent can be treated as an investment in the "Regulations for China-Foreign Jointly Managed Enterprises." In the "China-U.S. Trade Relation Agreement", both parties acknowledged the protection of patents in their trading relationship. Provisions for protection of patents by both parties are included in other cooperation agreements. We are law-abiding and agreement-abiding country, so it is necessary and inevitable that we set up a patent system.

As a matter of fact, because we did not have a patent system, our enterprises had to pay high prices for technology imports from international economic and technological dealings. A lot of our inventions were used by foreigners without their paying royalties, and sometimes our inventions were even copied and patented in other countries. These things limited our commodities exports.

As soon as we began the economic system, the central government decided to set up a patent system that conforms to our national conditions. The State Science and Technology Commission began preparations to set up a Chinese patent system in 1979. In August, 1980, the Chinese Patent Bureau officially began external work. At the end of 1980, a "Chinese Patent Law Symposium" was jointly convened by the State Science and Technology Commission and by the Chinese Patent Bureau. The symposium clearly proposed "to expand the autonomy of enterprises, to acknowledge that enterprises are commodity manufacturers which possess relative independence and, at the same time, to acknowledge the property rights of enterprise or of individual technological inventions."<sup>13</sup>

Because our country has just broken away from long-term, closed-door policy, the series of changes brought along by reform of the economic system need time to be digested, and understood. The whole country has begun an intensive discussion centered on setting up a patent system, a system that meets the demands of the nation's condition and, at the same time, "matches the international standard so as to be of advantage to international dealings."<sup>14</sup> This discussion started in March, 1980, and lasted more than 3 years. (It was not a long time in the history of the international patent system. It took Japan more than 10 years to set up its patent system.) During this period, the draft of the Chinese patent law was revised more than 20 times. Promulgating the patent law is only the first step in developing patent work. We need to go through arduous work, to accumulate experiences from practice, and to successfully set up a perfect patent system at an early date.

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#### FOOTNOTES

1. Capital, Renmin Chubanshe [People's Publishing House], offprint, Vol. 1, p. 202.

2. For scientific research labor, the purpose of which is to research and develop new technology for production, technology itself is also the object of labor. (Author).
3. Capital, Vol. 1, p. 204.
4. Ibid. P. 60.
5. "The development and Protection of Socialist Competition", in RENMIN RIBAO, August 3, 1980.
6. "Competition under conditions of Socialism", ibid., June 23, 1980.
7. RENMIN RIBAO, October 30, 1980.
8. Ibid., November 19, 1981 and December 7, 1983.
9. Ibid., June 16, 1983.
10. FAMING YU ZHUANLI [Inventions and Patents], 1981, No. 4, p. 43.
11. Ibid., 1983, No. 2, p. 11.
12. "The patent system and the management exchange of information on science and technology", in FAMING YU ZHUANLI [Inventions and Patents], 1983, No. 2.
13. RENMIN RIBAO, December 1, 1980.
14. "Vice Primier Wan Li talks about the setting up of the Patent Law" in JISHU SHICHANG BAO, November 5, 1983.

12669  
CSO: 4008/310

## NATIONAL DEVELOPMENTS

### FACTORS INFLUENCING INDUSTRIAL ASSIMILATION OF NEW TECHNOLOGY

Beijing ZIRAN BIANZHENGFA TONGXUN [JOURNAL OF DIALECTICS OF NATURE] in Chinese No 3, 10 Jun 84, pp 38-42

[Article by Liang Xingpeng [2733 2450 7720], Shanghai Department of Medicine and Hygiene: "Some Factors Affecting the Transition from the Results of Scientific Research to Industrial Production"]

[Text] The factors which limit the popularization and application of scientific results are of practical as well as theoretical significance. In this article we analyze and compare statistical data for several departments in Shanghai.

#### I. Analysis of the Partial Application of Scientific Research Results in Shanghai

Statistics show that between 1978 and the present, 40 percent of the major research results recognized for scientific merit in Shanghai were developed by research departments independently of industry. Sixty percent were completed by industry or by industry in collaboration with research teams (of the projects carried out by research groups in collaboration with industry, 80 percent involved cooperation between an enterprise and a research institute or department belonging to the same organization). In other words, there is little difference between projects carried out with or without the participation of industry. Furthermore, our examination of 654 scientific results made since 1980 in Shanghai's light industry, handicrafts and medical profession reveal that there is little difference in the number of advances made by research offices or by industry in cooperation with research teams (although there is a slight difference in the relative number of successful projects for different industries in different organizations, this is in fact caused by differences in the properties, specific features and available resources of the different enterprises). It may thus come as a surprise that the rate of utilization differs greatly. For example, between 55 and 65 percent (and in some cases, up to 70 percent) of all advances made by industry with or without the collaboration of research departments have found application in the light and handicraft industries; however, only from 15 to 30 percent [as published; see table 1] of the advances made by research teams independently of industry have been used (this percentage is somewhat higher for the

medical industry). In other words, the advances can be applied more easily and quickly when industry is involved in development.

Statistics show that of the 693 scientific research results made by industry with or without collaboration with research departments, only 97 or 14 percent were concerned with research and development (R&D) of new products; the remainder were all directed toward lowering the costs of already existing products. In other words, most of the achievements were concerned with solving current production problems.

By contrast, 254 (or 77.6 percent) of the 327 achievements made by researchers independently of industry were concerned with developing new products and techniques. This difference may explain why advances made with the participation of industry are much more likely to find application. For example, of the 500-odd advances displayed by research departments or developed by universities at the 1981 Shanghai Science Fair, only 30 percent were considered by production teams and the rate of utilization was very low.

TABLE 1

	Percentage of total advances made	Utilization rate (light industry, handicrafts)	Percentage of advances related to new products and technology
Developed by industry, with or without the cooperation of research depts.	40%	55-65%	14%
Developed by researchers independently of industry	60%	15-20%	77.6%

The following four conclusions may be drawn from the above analysis.

1. A high percentage of the advances not adopted by industry were developed independently by research teams.
2. Most of the scientific advances employed in production were developed by industry with or without the cooperation of research groups.
3. All of the applied research results directly addressed problems in current production and were aimed at improving and raising production without altering existing conditions. That is, these advances were preconditioned by the requirement that neither the structure of the products nor the original order of production should be changed.

4. Most of the research departments cooperating with an enterprise were in fact affiliated with it.

## II. Analysis of Factors Influencing Application of Scientific Research Results in Shanghai

According to the above analysis, more than one-half of research results in Shanghai do not result in economic benefits; of these, 70 percent of the most important innovations simply cannot be used under prevailing economic conditions. This situation has an adverse impact on efforts to improve industrial quality. In the following we will extend our analysis and examine the reasons for the inefficient assimilation of new technology by industry.

In brief, there are three principal factors which limit the ability of industry to absorb new technology and innovate--inadequate incentive, limited resources, and lack of ready access to information.

We will first discuss the problem of insufficient incentives.

We have seen that the application of scientific and technical results have been developed in the context of existing production techniques, equipment and operating procedures and have altered these only to the extent permitted by available manpower, material resources and financial investment. It is clear that the willingness of an enterprise to involve itself in innovation depends on the objectives of the management and the extent to which the innovations influence the processes by which the management goals are to be achieved. In general, the management objectives of typical industries in China today are to meet production quotas or ensure a certain percentage increase in annual production. Given China's present quota system, economic production departments can meet their objectives only by limiting their activities so as to guarantee the fulfillment of current production responsibilities; this of course puts a premium on the ability of new technology to assist in meeting the production objectives. One thus has two choices; either introduce new factors (uncertainties), or keep the existing product structure and production sequence intact and strive for sizable increases. In terms of fulfilling the production quotas, the advantages of the second alternative are beyond dispute. Moreover, the implementation of new technology can divert manpower, materials and financial resources from essential production activities. The adoption of new technology thus holds little attraction of economic production units; indeed, implementation might even hinder the achievement of management objectives, and the incentive for modernization is in inverse proportion to the extent of the required changes and their incompatibility with production targets. In many cases, unless top management provides favorable conditions and changes the work assignments and organizational coordination, there will be very little incentive for industry to modernize.

In addition to the problem of incentives discussed above, innovation is contingent on the availability of adequate financing. If an enterprise wants to modernize, it must possess enough manpower, material resources and

money. Given the limited autonomy of enterprises and their outmoded economic organization, the resources needed to assimilate new technology can only act as a powerful disincentive for modernization. We will first consider the problem of financing.

Statistics indicate that Japanese industry devotes some 5-10 percent of sales revenues to investment in research and development; this contrasts with a mere 0.5 percent in Shanghai. According to 1982 statistics on the R&D expenses of three industrial departments in Shanghai, R&D outlays for the Department of Light Industry amounted to just 0.05 percent of annual production; the corresponding figures for the handicrafts and medical industries were 0.014 and 0.01 percent. Such extremely low R&D funding is inadequate to support major research and development or to compensate enterprises for expenses incurred in development. In addition, the need to attend to the various requirements of all industries necessitates additional expenditures which reduce the pathetically small amount of money allocated to industry for R&D still further, so that large-scale innovations are difficult or impossible within a short period of time. Experience shows that it is wasteful to underallocate funds for R&D and let available funding determine which research projects will be carried out. Available funds have been further wasted because of internal friction caused by problems in management. For example, at the largest oscilloscope plant in China, the Shanghai Oscilloscope Plant, because of inadequate planning for technical modernization, only about 25,000 yuan per year is allocated by management for research and development, which is just a drop in the bucket compared with the minimum of 500,000 yuan per year needed for the development of new products. The Shuguang Machine Building Plant in Shanghai, which specializes in producing vacuum pumps and equipment, is another example. Approximately 150,000 yuan is needed for new product development, but in fact only about 20,000 yuan is supplied through normal channels. The State Council has adopted a policy of actively supporting new product development by industry, and in Dec 1982 the Department of Financial Administration instituted new regulations governing the financing of R&D expenditures. Nevertheless, the actual implementation of these changes has not been satisfactory. For instance, consider the regulations relating to expenses for materials, wages and special equipment (dies, special lathe attachments, etc.) involved in the development of new products. It is very often the case in practice that R&D funding is provided only once rather than periodically, as may be required, because of difficulties in determining how long the periodic funding should be continued and how it will influence the amount of new production--these problems are complex and their solution requires elaborate calculations which are difficult to carry out given the rudimentary level of management techniques in China today. In any case, expenses incurred are quite considerable and unquestionably raise the price of new products; the resulting competitive disadvantage is one of the reasons why industry is reluctant to develop new products. As another example, the regulations of the Department of Financial Administration allow for certain industries to apply for permission to set aside one percent of total sales revenue to cover R&D expenses and augment the pool of money available for new product development. In practice, however, this has not solved the problem, because

the rules are vague on the conditions under which the money can be set aside and the funds can be spent for purposes other than the intended research and development. As a result, those industries which innovate technically do not in fact receive any additional support from the new central policy. Thus, no progress has been made toward providing either incentives or financing for technical innovation.

The technical transformation of an enterprise will necessarily be influenced by the technical level of its existing equipment.

The application of complex new technology generally follows major technical breakthroughs. However, many of the departments in Shanghai are very backward technologically, with many production units (roughly 50 percent, according to insider estimates) still using outmoded technology from the period 1930-1950. Before newer technology can be applied, the work procedures and techniques of these industries will have to be revamped and improved, a task which is currently impractical in view of the extremely large amount of work required. Modernization of industry is thus impossible not only because of heavy production workloads but also because the necessary materials and conditions are lacking.

Research and development and the popularization of research results have also been limited by industrial weaknesses and an inability to understand, adopt, and select relevant new technology.

A. Technical resources for handling "documentation" are lacking. According to 1980 statistics, 165 enterprises (25 percent of the total) in Shanghai's handicraft industry bureaus lack technical personnel altogether. Other data indicate that 168 enterprises (more than 50 percent) in light industry in Shanxi Province have no technical personnel; for Changsha in Hunan Province the corresponding figure is 83 (52 percent).

B. There is a shortage of highly skilled technicians. According to 1982 statistics, roughly 37 percent of enterprises in the handicrafts and light industries in Shanghai lack engineers, and 13 percent do not even have an assistant engineer.

C. Ordinary technical personnel are also scarce. Statistics indicate that China's 69,000-odd enterprises in light industry employ only 10,000 technicians, or just 0.9 percent of the more than 11,200,000 jobs in the industry. Typical enterprises at present have approximately one technician per 100 employees, and in many cases as few as one per 200 workers.

It is thus clear that without the assistance of research departments, these enterprises will encounter great difficulties in adopting complex new technology. Yet precisely because of their low technical level and inability to apply technology, many research departments are skeptical of them and unwilling to provide technical assistance.

In the above discussion we have emphasized the role of managerial goals and technical strength in the implementation of new technology by industry.

But this is clearly not the whole story. While the adoption of new technology does depend on how well the technical requirements imposed by actual managerial objectives are satisfied, implementation is also contingent on management's ability to understand the new technology. If the technology does not meet management's needs, technical development will proceed blindly in a hit-or-miss fashion; on the other hand, if management does not understand the technology, it will be unable to make intelligent decisions about which new technologies to adopt. It is vital to maintain a free flow of information during the development and implementation of new technology.

The above analysis supplies only rather preliminary answers to the problem of assimilation of technology by industry. Of the 11 enterprises which we examined, six had previously cooperated with research units in technological development or received new technology directed from researchers; only one of these six enterprises had collaborated with a research group not affiliated with the same department; and none of them ever formed associations with research groups outside their home cities. The management of three of the 11 enterprises were unaware that research facilities were available outside their companies and departments, and in two cases the leadership was even unaware that a source of technical information was available in their city. The relations between research and industry will necessarily be severely restricted if business opportunities are confined to within a single administrative division. We thus understand why most of the technological advances adopted by enterprises were developed either independently by the enterprise or with the assistance of research units belonging to the same administrative department. Some changes have occurred in recent years, however. For instance, interdepartmental statistics indicate that the popularization rate was seven times higher than usual during one month at a technical exchange fair in which Shanghai universities participated. This illustrates how seriously organizational problems can impede the flow of information and hinder the large-scale application of technology.

There is another problem here, namely the practical relevance of the work done by the research groups. As we have noted above, only 21.4 percent of the 327 scientific research results made independently by research groups were adopted by industry. This low percentage prompted us to visit the relevant departments; however, the results of the interviews were astonishing. The interviewees stated that the overwhelming majority of the 327 projects dealt with problems selected according to the needs of the production departments; in other words, it is by means certain that new research will enter the pipeline even if it deals with production requirements. This would seem to imply that new developments become accepted only if certain preconditions are satisfied. When asked what these conditions might be, the personnel in the economic production departments responded that the technical advances were mostly unused because they were not needed. We were able to resolve this apparent contradiction only gradually. It turned out when the officials said that the research work was initiated to meet production needs, this simply meant that research workers had been requested, e.g., to identify problems in front-

lint production; however, they had been provided with very imprecise and ambiguous information concerning the actual requirements of the production departments. This was clearly the reason why the research results deviated from the specific requirements of the economic production units; the lack of acceptance was a consequence of the discrepancies between the goals of the research and the original specific objectives of the worker units.

As we have pointed out, most of the research groups able to collaborate with enterprises were affiliated in the same system. It is well known that the key to an effective organization lies in its structural elements and in the relations between those elements. If the parts are present but are not interrelated, an effective organization is not possible. Practical experience demonstrates that the adoption of new technology by industry requires internal communication, not only during the stage of application but also throughout the research and development period, which demands collaboration, communication and regulation by the parties involved. In practice, speedy application of the fruits of collaboration between research and industry is promoted when the collaborators belong to the same organization, since there are more channels of communication and development proceeds under a unified policy. Conversely, if the research is not done "in-house," departments will be less able to utilize the research results that they themselves have requested. That is, failures in "managerial relations" discourage application.

### III. Conclusion

In this article we have enumerated some of the statistics relevant to the application of scientific and technical results in Shanghai and discussed some of the factors responsible for the low rate of utilization. In our opinion, the absence of incentives for technical innovation, the lack of easy communication, and the inadequate ability of enterprises to innovate can all be clearly traced to structural defects in the Chinese economy and in research. The application of technology, should be improved substantially by encouraging organizational reform: On the one hand, enterprises should be accorded greater autonomy, and their awareness of the desirability of modernization and their ability to modernize must be enhanced; on the other hand, petty obstacles must be eliminated and wider dissemination of information fostered.

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CSO: 4008/399

## NATIONAL DEVELOPMENTS

### PRC TO ESTABLISH INVENTORS ASSOCIATION

OW132009 Beijing XINHUA Domestic Service in Chinese 1137 GMT 13 Oct 84

[Text] Beijing, 13 Oct (XINHUA)--The State Scientific and Technological Commission and the All-China Federation of Trade Unions recently made a decision to set up a Chinese inventors association.

The decision was made under the kind concern and support from concerned leading comrades of the party Central Committee and the State Council and at the proposal of 103 comrades dedicated to the work of invention, including Ni Zhifu, Wu Heng, Wang Zhaoguo, Shen Hong, Wang Chonglun, Qian Xuesen, Yan Dongsheng, Song Jian, and Chen Huibo. The fundamental objectives of the association are to further harness and discover the enthusiasm for invention and creativeness among the masses, protect inventors' rights, and make technological inventions serve economic construction. The main tasks of the association are to penetratingly carry out the "regulations of the People's Republic of China concerning awards for inventions," actively guide, encourage, and support inventions and creative activities, develop extensive contests, exhibitions, exchanges, and information services, and organize exchanges with similar bodies in other countries and with international organizations.

A responsible person of department concerned under the State Scientific and Technological Commission said: The inauguration of the Chinese inventors association is an event long awaited by all those who care for, support, and engage in inventing and creative activities. It will definitely promote an upsurge of mass creative activities and bring about more inventions to contribute to turning technological inventions to productivity.

CSO: 4008/52

## NATIONAL DEVELOPMENTS

### BRIEFS

**NEW INFORMATION JOURNAL**--The first issue of "WEN HUI XINXI BOA" [WEN HUI INFORMATION JOURNAL] was published in Shanghai on 1 September. The journal, jointly published by the WEN HUI BAO Editorial Department and the WEN HUI Scientific-Technological Company, aims at providing scientific-technological and economic information to scientists, entrepreneurs, specialized households, and other interested readers. The journal will begin nationwide distribution in October. [Summary] [Shanghai WEN HUI BAO in Chinese 1 Sep 84 p 1]

**SHANDONG SCIENTIFIC, TECHNOLOGICAL UNDERTAKINGS**--By the end of 1983, Shandong Province had 318 independent scientific research organs, 29 research units subordinate to higher educational institutions, and 1,521 research units operated by mining and industrial enterprises. The number of technicians engaged in natural sciences reached some 330,000 persons. Of this, some 256,000 persons had technical titles. Among them, some 1,800 persons were high-ranking technical personnel, and 47,000 were middle-rank personnel. The number of specialized households engaged in scientific undertakings reached some 1.5 million. In 1983, scientific funds of three categories and funds for scientific undertakings increased by 54.6 percent and 34.63 percent respectively over 1982. In the past 35 years, this province succeeded in some 9,000 scientific research findings. [Summary] [Jinan DAZHONG RIBAO in Chinese 19 Sep 84 p 1 SK]

CSO: 4008/52

## APPLIED SCIENCES

### PREPARATIONS COMPLETE FOR FIRST ANTARCTIC SURVEY

0W130148 Beijing XINHUA Domestic Service in Chinese 1251 GMT 11 Oct 84

[Article by correspondent Wang Jianwen and reporter Zhu Youdi]

[Text] Beijing, 11 Oct (XINHUA)--All preparations have been completed for our country's first scientific survey of the Southern Antarctic Ocean [nan da yang 0589 1129 3152] and Antarctica. More than 4,000 items, including tools, equipment, and materials weighing nearly 500 metric tons in total, have been properly checked and created. They are being sent from various localities to Shanghai, the starting point of the survey trip.

The preparatory work for the scientific survey of the Southern Antarctic Ocean and Antarctica began last June. This was an urgent task. It must meet high demands and involved considerable difficulties. Quite a number of tools and pieces of equipment were quickly made domestically in the past few months. In order to build a scientific survey station and conduct surveys during Antarctica's summer, some 40 pertinent units under more than 20 departments and commissions pooled their efforts to develop the required tools and equipment. The tools and equipment were then tested repeatedly to make sure that they would meet the requirements of Antarctic weather conditions and all other possible situations that might occur on that continent. The task of developing and testing these tools and equipment was completed quite satisfactorily. The equipment used in the Southern Antarctic Ocean survey for determining the deep-sea temperature and salinity and for measuring depth was developed after only 3 months of efforts by the Oceanographic Technology Research Institute of the State Oceanography Bureau and is presently being tested and adjusted. A prototype house for the Antarctic station was erected by the China New Building Materials Corporation in early September. The China Electric Wave Communications Research Institute conducted many tests of a telecommunications system designed to enable the Antarctic station to communicate directly with Beijing.

The oceangoing scientific survey ship, "Xiangyanghong No. 10," and the [words indistinct] rescue ship, which will be used for scientific survey and transportation on this trip, will be sent to the shipyard in July and August for maintenance and renovation. Several hundred maintenance and renovation jobs on the ships, including the installation of a shipboard satellite communications receiving station and a radar device to avoid collision, have been by

and large completed. The ships are expected to leave the shipyard and make their test runs in the near future. The two ships will carry two freight boats to be used for landing and other purposes in connection with the construction of the survey station. It took only 2 months to design and build the boats and to test them in water. All these activities have been completed in record time.

At present, two scientific survey teams--the Southern Antarctic Ocean Survey Team and the Antarctic Survey Team--have been officially formed. Survey personnel who will land on Antarctica to build the survey station are now undergoing collective training. The Southern Antarctic Ocean Survey Team has 108 members, including 2 Argentine scientists. This team will complete the task of investigating and surveying 350,000 square kilometers of waters in the Bellingshausen Sea of the Southern Antarctic Ocean while the other team is building the survey station.

CSO: 4008/51

## APPLIED SCIENCES

### GUANGXI HOSTS CENTRAL-SOUTH CHINA TECHNOLOGY SYMPOSIUM

HK260857 Nanning Guangxi Regional Service in Mandarin 1130 GMT 24 Oct 84

[Text] The third symposium of the four provinces and one region in Central-south China on workers' technological cooperation opened in Nanning on 23 October. This is another grand meeting of outstanding workers to unfold workers' technological cooperation in the Central-south China region.

The more than 150 richly experienced and consummately skillful experts, scholars, engineers, technicians and craftsmen attending this symposium will offer advice, will exchange experiences, and wil make concerted efforts to solve difficult technological problems in the course of production.

The opening ceremony of the symposium was presided over by (Li Wenxin), vice chairman of the Guangxi Zhuang Autonomous Regional Federation of Trade Unions. (Meng Yiping), chairman of the Regional Federation of Trade Unions, delivered the opening speech. Leaders of the regional people's government and the Nanning City CPC and government went to the symposium to extend greetings. Responsible comrades of the federations of trade unions of Henan, Hubei, Hunan and Guangdong Provinces are attending the symposium.

Gan Ku, vice chairman of the regional people's government, spoke at the symposium. After praising the achievements made by the Central-south China Region in unfolding workers' technological cooperation, he said: "We must further carry out workers' technological cooperation at many levels and in many trades between areas. We must absorb into the organizations of workers' technological cooperation more skillful craftsmen, engineers, technicians, experts, scholars, advanced figures with special skills or knowledge in all trades, retired engineers and technicians, and retired veteran workers. We must regard the raising of economic results as the main work and concentrate on enterprises' technological transformation, extensively tackle key technological problems, carry out technological exchanges, provide technological advisory services and conduct technological training.

Vice Chairman Gan Ku expressed the hope that the comrades in Guangxi will humbly learn from the good experiences of Henan, Hubei, Hunan and Guangdong Provinces. Through this symposium, they will further promote our region's technological progress and will make our region's socialist economic construction thrive.

CSO: 4008/84

## APPLIED SCIENCES

### LANZHOU MEETING ON TECHNICAL SUPPORT OF NORTHWEST

OW290447 Beijing XINHUA Domestic Service in Chinese 1322 GMT 28 Oct 84

[Text] Lanzhou, 28 Oct, (XINHUA)--A number of skilled technicians from more than 10 industrially developed cities of the country met in Lanzhou, Gansu, on 28 October to help factories, mines and enterprises in Northwest China solve knotty technical problems as a contribution to the region's economic development.

This technical cooperation among workers and staff members in support of Northwest China was organized by the All-China Federation of Trade Unions. More than 40 top technicians, skilled workers, and engineers from Shanghai, Beijing, Tianjin, Shenyang, Nanjing and other cities took part in the project. Their primary task was to support factories, mines and enterprises in Lanzhou City. However, other cities in Northwest China also put forth some difficult technical problems to them upon hearing of this meeting and urged them to solve these problems on the spot.

Wang Chonglun, vice president of the All-China Federation of Trade Unions, made a speech at the meeting on technical cooperation among workers and staff members in support of Northwest China, speaking highly of the significance of this activity. He said that the large-scale mass technical cooperation was a true manifestation of the spirit of the workers as the masters of the country, and a pioneering undertaking of the Chinese workers. The current urban economic reform and enterprises' technical transformation impose still greater demands for technical cooperation among workers and staff members. This task should be carried out in accordance with the central leaders' instructions and should be extended from cities and areas to greater regions with the emphasis on supporting the rural enterprises and economically backward areas in order to promote the development of the production forces.

CSO: 4008/84

LIFE SCIENCES

BRIEFS

FAST NEUTRON CANCER TREATMENT LAB--A fast neutron cancer treatment research laboratory for the High Energy Physics Institute of the Chinese Academy of Sciences is under construction in Beijing. The foundation was completed within the past few days. The construction of this research laboratory will promote the development of nuclear medicine facilities and fill in the gaps in the field of nuclear medicine in China. [Excerpt] [Nanjing XINHUA RIBAO in Chinese 10 Sep 84 p 3]

CSO: 4008/82

## ENVIRONMENTAL QUALITY

### SEWAGE SLUDGE IN TIANJIN'S SEWAGE STUDIED

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 6, Dec 83 pp 4-7

[Article by Wang Naihong [3769 0035 1347], Lu Kaixuan [6424 0418 2457], Shi Wenjing [4528 2429 7231], Ren Shunrong [0117 7311 2837] et al. of Institute of Soils and Fertilizers, Tianjin Academy of Agricultural Sciences: "Study of Sewage Sludge at Six Main Sewage Outfalls of Tianjin Municipality"]

[Summary] Highly concentrated organic matter with nitrogen, phosphorous potassium and trace elements are constituents in some 876,000 tons of annual sewage sludge in Tianjin Municipality; however, large amounts of toxic heavy metals in sewage pose the problem of whether or not secondary pollution will result. Optimal application of sewage sludge per mu of farm field is studied so that optimal economic effectiveness is achieved while avoiding harmful pollution side effects. Generally first the raw sewage sludge undergoes fermentation to prevent noxious effects of hydrogen sulfide as a reducing agent, as well as to kill disease causative agents and insect eggs. Following two years' experimentation of pot cultivation on rice yeilds with an analysis of cadmium, lead, copper and zinc contaminants in unpolished rice, the optimal sewage sludge amount is 750,000 jin per mu applied in alternate years to avoid pollution from metals and excess nitrogen. Five tables list the constituents of metals and nutrients in sewage sludge, metal pollutions in soil and unpolished rice, as well as nitrogen in soil.

10424  
CSO: 4009/63

## ENVIRONMENTAL QUALITY

### PREVENTION, CONTROL OF OIL POLLUTION IN SHENYANG-FUSHUN AREA

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENT PROTECTION] in Chinese No 6, Dec 83, pp 8-12

[Article by Wu Weizhong [0702 4850 0022], Sun Tieheng [1327 6993 3801], Hong Lihua [3163 7787 5478] and Yang Zufan [2799 4371 5400] of Institute of Forestry and Pedology, Chinese Academy of Sciences: "Oil Pollution in Sewage Irrigated Area of Shenyang and Fushin, and Comprehensive Control"]

[Summary] Residues of petroleum contaminants (including alkanes and aromatic hydrocarbons) in soil and rice grains following multiannual irrigation of petroleum sewage pose a pollution problem. Self cleaning by soil and plants treated with organic sewage permits the use of nutrients and water in sewage, thus raising crop yields. In the irrigation area of Shenyang and Fushun, oil pollution is caused by sewage from the Fushun oil refinery. The petroleum content in the main sewage outlet was 100 milligrams per liter, ten times higher than the state allowable standard of 10 milligrams per liter. The petroleum content can be diluted by blending other sewage with the refinery sewage. In addition, 2 percent yellow clay is added to the sewage, acting as an absorbent; after 30 to 60 minutes of blending, 90 percent of organic contaminants (such as petroleum and phenol) can adhere onto the clay, which settles in a settling pond of an urban sewage treatment plant. Thus, the mineral oil in sewage can be reduced to a level that is environmentally acceptable. The sewage sludge (absorbed in clay) can be used repeatedly until saturation. Next, the deposit can be fed into a kiln to make bricks. Following irrigation, the treated sewage can be directly drained into a water system without causing any pollution. Ten tables show hydrocarbon contaminants in soil, a comparison between hydrocarbon contaminants in grains of rice irrigated with sewage and with fresh water, petroleum residues in topsoil and annual purification rate following one year of sewage irrigation, and growth of rice plant irrigated with fresh water and with sewage of different petroleum contents.

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CSO: 4009/63

## ENVIRONMENTAL QUALITY

### PROBLEM OF PURIFYING HOSPITAL SEWAGE EXAMINED

Beijing JIANKANG BAO in Chinese 20 May 84 p 1

[Commentary: "Do Not 'Cure Illness at the Front Door While Discharging Toxins Through the Back Door' "]

[Text] The problem of purifying hospital sewage has attracted the attention of some hospitals in recent years. They have adopted effective measures and achieved fairly good results.

Looking at the results of an investigation in some provinces, municipalities and autonomous regions, however, sewage from the great majority of hospitals is discharged directly without being sterilized and treated at present, to the extent that it has led to the spread and outbreak of diseases such as intestinal infections. Examples include a tuberculosis sanitarium in a certain city discharging more than 100 tons of sewage daily that infected more than 20 percent of the residents in villages downstream, or the residents of a certain city who ate vegetables irrigated with sewage containing typhoid bacteria, causing an outbreak of typhoid, and so on. These examples show fully that the danger from hospital sewage is fairly serious, and that we can no longer remain indifferent to it.

Doing good work to disinfect and treat hospital sewage is an effective measure for adhering to the principle of "prevention foremost." In order to transform the phenomenon of "curing illness through the front door while discharging toxins through the back door" as quickly as possible, public health departments at all levels should be required to operate conscientiously according to the notice of the Ministry of Public Health. They should include this line of work in environmental administration planning and install facilities for treating hospital sewage that are simple, economical, and easy to operate and manage so as to transform the backward situation of pollution of the environment by hospital sewage.

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## ENVIRONMENTAL QUALITY

### NOTICE ON TOXIC DISCHARGES FROM HOSPITALS ISSUED

Beijing JIANKANG BAO in Chinese 20 May 84 p 1

[Article: "The Ministry of Public Health Issues a Notice on Strengthening Disinfection and Treatment of Hospital Sewage--Resolutely Transform the Backward Situation of Environmental Pollution from Hospital Sewage"]

[Text] In order to transform the backward situation in environmental pollution from hospital sewage, the Ministry of Public Health recently issued a notice concerning the strengthening of work for disinfection and treatment of hospital sewage that makes the following demands:

1. Public health administration departments at all levels should carry out a comprehensive investigation of the situation in disinfection and treatment of sewage discharged from hospitals in the areas or units under their jurisdiction.
2. Before 1985, medical organs under the jurisdiction of the Ministry of Public Health, infectious disease hospitals and tuberculosis sanatoriums under public health departments at all levels, hospitals under the jurisdiction of provincial, autonomous region and municipal governments, and the comprehensive hospitals in cities that are the seats of provincial governments all should establish sewage treatment measures, allocate inspection and technical forces and take responsibility for day to day monitoring so that all sewage discharge meets the requirements of the state "Standards for Hospital Sewage Discharge."
- Hospitals at other levels should gradually establish facilities for the treatment of hospital sewage.
3. Hospitals that have already established facilities for sewage treatment should strengthen management, implement specialized personnel responsibility and establish a system so that sewage treatment facilities are kept in normal operation and provide full results.
4. New construction, rebuilding or expansion of hospitals at all levels must achieve simultaneous design, construction and utilization of sewage treatment facilities in combination with the principal project.

5. While carrying out inspection and checking of hospitals, public health departments at all levels should treat work for the treatment of hospital sewage as an important aspect of their work. Public health supervision organs at all levels should carry out public health supervision of sewage treatment conditions in hospitals under their jurisdiction according to the requirements of the national "Standards for Hospital Sewage Discharge."

It was also proposed that medical and public health organs under the jurisdiction of all other departments should adopt effective measures to attain the national "Standards for Hospital Sewage Discharge" at the earliest possible date.

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## ENVIRONMENTAL QUALITY

### RESEARCH ON POLLUTION FROM THERMAL POWER PLANT

Fuzhou FUJIAN RIBAO in Chinese 22 May 84 p 3

[Article: "Research on Pollution Forecasting is Underway, Results Obtained in the First Large-Scale Experiment--Environmental Protection Countermeasures Are Formulated for the Zhangping Thermal Power Plant"]

[Text] Environmental forecasting work has begun at the Zhangping Thermal Power Plant project, and the first cutside experiments were recently concluded.

The Zhangping Thermal Power Plant, which has an installed generator capacity of 200,000 KW, is among the primary construction projects that Fujian is arranging. Environmental forecasting and evaluation, an important component of preliminary work in this construction project, is now underway. The goal is to use research on atmospheric pollution for pre-evaluation of the environment to provide scientific data for compilation of a report on the environmental impact of the power plant project and formulation of countermeasures for environmental protection.

From the last part of June to mid-July, the Fujian Environmental Protection Scientific Research Institute led the way for organization of the Longyan Prefecture Environmental Protection Monitoring Station. Some 57 engineering and technical personnel from 12 units including the Zhangping County Urban Construction Environmental Protection Bureau and others, under the leadership of Chinese environmental sciences specialists carried more than 80 instruments and placed them in an area of more than 200 square kilometers around the preselected plant site to carry out the first large scale testing. The contents of this largest scale atmospheric pollution study in Fujian at the present time includes pollution and climatic conditions, atmospheric dispersal parameters, conventional weather observations, models of atmospheric pollutant dispersal, monitoring of background levels of atmospheric pollutants, and others. The first testing obtained 300,000 pieces of data.

The engineering and technical personnel responsible for the testing told this reporter that this research project will include three additional field tests. Looking at data processed by electronic computers, the reliability and precision of the first test achieved fairly ideal levels. They show that environmental protection departments in Fujian have the ability to undertake environmental pre-evaluation work in large and medium scale construction projects.

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## ENVIRONMENTAL QUALITY

### DEVELOPMENTS TO ELIMINATE SULFUR DIOXIDE EMISSIONS

Beijing ZHONGGUO HUANJING BAO in Chinese 22 May 84 p 3

[Article by Yang Yang [2799 7370]: "The Current Conditions and Developmental Prospects for Desulfurization of Smoke Emissions in China"]

[Text] At present, Japan and America are the world leaders in carrying out large-scale desulfurization of smoke emissions and in the number, capacity and technical levels of desulfurization equipment. Japan uses mostly wet methods, while America uses dry methods. Japan is heavily concerned with recovery methods, while America stresses disposal methods. By 1981, Japan had 1,362 sets of various types of desulfurization equipment, with a total treatment capacity of 1.3 billion standard cubic meters per hour. America implemented large-scale desulfurization later than Japan. There was unceasing debate for many years on the question of desulfurization of smoke emissions. The Supreme Court ruled in favor of desulfurization in 1978 and thereby ended this protracted "environmental lawsuit", greatly promoting the desulfurization of smoke emissions in America. The situation in recent years shows that America has come from behind and surpassed Japan in equipment capacity and levels. In 1981, the capacity of desulfurization equipment actually operating in thermal power plants alone totalled 30 million KW, and it is predicted that the equipment capacity in 200 newly constructed or transformed coal-burning power plants will exceed 60 million KW by the year 1990.

Desulfurization of smoke emissions in China began in the 1950's. Since the founding of the country, several dozen units have carried out research on the desulfurization of smoke emissions, and a group of desulfurization equipment at an industrial scale has been constructed. Examples include:

The Shanghai Zhabei Power Plant's limestone and gypsum method.

The Shanghai Nanshi Power Plant's catalytic oxidation method.

The Hunan No. 300 Plant's W-L method.

The Shuikoushan Mine Services Bureau's zinc oxide method.

The Hubei Songmuping Power Plant's iodine activated carbon method.

The Nanhua Nitrogen Fertilizer Plant and the Huludao Zinc Plant's amino acid method.

The Guangzhou Sulfuric Plant and the Hangzhou Sulfuric Acid Plant's hyposodium method.

The Nanjing Iron and Steel Mill and the Shenyang Refinery's basic aluminum sulfate method.

The Southwest Electric Power Design Academy's spray drying method.

The Mian Thermal Industry Research Institute's phosphorous-ammonium fertilizer method.

In China at present, the large-scale use of techniques for desulfurization of smoke emissions is limited to the chemical industry and non-ferrous metals refining enterprises. According to statistics, 47,000 tons of sulfur dioxide are discharged by iron and steel enterprises in China each year, all of it through high smokestacks. The electric power industry discharges more than 2.4 million tons of sulfur dioxide annually, and they do not yet have any industrial-scale desulfurization equipment. This situation is not suited to construction of the four modernizations and demands that there be changes. Acid rain has appeared in 22 provinces and municipalities throughout the country in recent years, making the control of sulfur dioxide discharges an urgent task. The large-scale development of desulfurization of smoke emissions is a major trend.

Work for desulfurization of smoke emissions in China started quite a while ago, but the rate of progress has been slow. In China, the desulfurization of smoke emissions as an important measure for controlling sulfur dioxide has not been widely accepted, much less given attention. There is a question of knowledge here, and of course there are also policy and economic factors. To a great extent, the development of equipment for desulfurization of smoke emissions is determined by the fiscal abilities of a nation and societal demands for environmental quality. In foreign countries, the debate on whether or not to desulfurize smoke emissions has basically ended, but it appears that the debate will continue for years in China.

Since the 1970's, total discharges of sulfur dioxide in the world have been increasing at an annual rate of 5 percent, and have reached 200 million tons per year. It is estimated that the figure could exceed 330 million tons by the end of the century. The situation in China is that there has been an average increase of 1 million tons per year, with a total discharge of around 18 million tons of sulfur dioxide in 1982. It is estimated that this amount could exceed 36 million tons by the end of the century, making China second only to America in sulfur dioxide emissions.

In China at present, apart from the debate on whether or not we should desulfurize smoke emissions, there is also a debate on whether to use recovery or disposal methods, and wet methods or dry methods. These three problems must be discussed in terms of a series of technical and economic questions.

Based on national conditions in China, during the period of the four modernizations program, there are hundreds of activities that have not yet been undertaken and there is insufficient capital. In the development of technologies for desulfurization of smoke emissions, we should pay attention to selecting desulfurization equipment with the lowest investment costs and energy consumption. At the current stage, it is best for China to develop desulfurization equipment that emphasizes disposal methods and dry methods, and lime or limestone should be selected as the main absorption agents. We should centralize human and material resources, organize attacks on key technical and economic problems, and come up with a way to reduce the investment costs of desulfurization equipment to less than 120 yuan per KW. For this reason, we should as quickly as possible import samples of dry method equipment and speed up the development of desulfurization technologies. We hope that the related departments will formulate policies to encourage and assist desulfurization of smoke emissions. I propose that an integrated development group for desulfurization of smoke emissions be established in order to facilitate strengthened vertical relationships in scientific research, design and production, and horizontal relationships between the various departments, so as to rapidly develop desulfurization of smoke emissions in China.

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## ENVIRONMENTAL QUALITY

### SICHUAN BASIN SOIL EROSION DISCUSSED

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION]  
in Chinese No 3, Jun 84 pp 15-18

[Article by Zeng Fanhui [2582 4907 6540], of Sichuan Agricultural College: "A Discussion on the Problem of Soil and Water Erosion in the Sichuan Basin"]

Sichuan is situated in the southwest of China. Topographically, the entire province can be divided east and west into two large portions. The eastern portion is the famous Sichuan Basin and the western portion is the Sichuan Plateau. Longmen Shan, Qionglai Shan, the Daxiang Ling and the Xiaoxiang Ling are considered to be the boundary between the two--roughly, the eastern borders of the three autonomous prefectures of Aba, Garze and Liangshan form the demarcation line. Industry and agriculture in the province are primarily concentrated and distributed within the approximately 200,000 square kilometers of the Sichuan Basin. The basin is surrounded by mountain ranges and its central portion is low and flat. Because the basin is largely composed of purple-red sand and shale deposits, it is also called "the Red Basin." The ground is high in the north of the basin and low in the south, the altitude ranging from 300 to 600 meters. Approximately 7 percent of this area is flat, 52 percent is hilly and 41 percent is composed of low mountains, providing excellent conditions for multipurpose development in agriculture, forestry, animal husbandry, sidelines and fisheries.

However, the Sichuan Basin is confronted with one prominent problem: soil and water erosion.

#### I. Alarming Soil and Water Erosion

The destruction of soil resources in the Sichuan Basin is extremely severe. This is manifested in the following forms: (1) soil erosion; (2) soil degradation; (3) soil pollution; (4) reduction in the area of cultivated land. These ultimately lead to a drastic decline in agriculture production.

Soil and water loss is one type of soil erosion. Soil erosion in the Sichuan Basin is primarily water erosion arising out of soil and water erosion during rainfall-produced surface runoff. In the 1950s the total area of soil and water erosion from the province was 94,600 square kilometers. According to estimates for the early 1980s, the area of soil and water erosion has already reached 380,000 square kilometers. This approaches the total area of soil and water erosion from the Changjiang drainage basin during the 1950s (for that period the soil and water erosion along the entire Changjiang drainage basin was 400,000 square kilometers). The volume of soil loss at present is already more than 600 million tons, which serves to show the degree of severity of soil and water erosion. "All the creatures in the world are brought forth from the soil; where there is soil there is grain." This has been a wise teaching since ancient times. Would people want there to be no soil at all? Therefore, prevention of soil and water erosion and satisfactory soil and water conservation are fundamental measures to be taken to protect these resources and put them to good use, as well as to develop agricultural production, transform the features of hilly and mountainous areas, harness the rivers, reduce flood and drought disasters and build a good ecological environment. This is also important foundation work that lays the basis for agricultural modernization and for socialist economic construction and national land management.

The damage of soil and water erosion can be summarized in the following few points: the soil layers become thin and the soil is rendered infertile; the water-storage capacity of the soil is reduced and drought resistance is weakened; too much manpower is expended; production costs are increased; agricultural fields are buried; pools, ponds and river courses are silted up; plains are damaged; and natural disasters occur frequently. We will take Tongnan County, which is situated in the heart of Sichuan's agricultural area, as an example. Tongnan County is a purple-earth region of extensive hills, with soil that has been disseminated widely from purple parent material formed in Suining. It is also one of the areas of most serious soil and water erosion in the Sichuan Basin. Judged by today's soil erosion criteria, Tongnan County became an intensely eroded region a long time ago. China's soil erosion criteria stipulate that whenever an area has an erosive modulus<sup>1</sup> of more than 5,000 tons/square kilometer/year, that area is designated a region of soil and water erosion; if the erosive modulus exceeds 10,000 tons/square kilometer/year, then that area is designated an intensely eroded region. The conception of thickness that applies to these two erosive moduli are four millimeters and eight millimeters, respectively.<sup>2</sup> That is, any particular place where the soil is thinned by an average of four millimeters per year is an area where there is soil and water erosion, and it is designated a region of soil and water erosion; if the soil layer is reduced each year by an average of eight millimeters, then that area is designated

one of intense soil and water erosion. According to these criteria, the following counties within the Sichuan Basin are all designated intensely eroded regions: Jianyang, Lezhih, Ziyang, Rongchang, Suining, Zizhong, Neijiang, Anyue, Pengxi, Nanchong, Yingshan and Yuechih. Because the average annual volume of soil loss in these counties is more than six cubic meters per mu, if we continue to apply a unit weight of 1.25 tons of soil per cubic meter then, a six cubic meter soil-loss volume produces an erosive modulus amounting to 11,250 tons/square kilometer/year; the criterion for an intensely eroded region has long since been exceeded in these areas. Purple earth that has developed on top of purple mudstone, and a thin dryfarm soil layer less than 1/3 meter thick, characterize nearly half of the dryfarm fields managed by Suining Team in Tai'an Commune, Tongnan County. We conducted an investigation at the "Huoshao slope" site in the Fourth Production Team of Tai'an Commune's Third Production Brigade. This is a barren, 0.4 mu slope that is situated on the hilltop and formed from the convergence of two tablelands. Owing to intense weathering effects, the mudstone has broken down into chunks of 5~10 centimeters in diameter and fragments of about 5 millimeters in diameter, and on the mesa and terrace walls there are, altogether, 145 funnel-shaped erosion gullies. Of these funnels, there are 8 that exceed 2 meters in diameter, 11 that are 1~2 meters in diameter and the remainder are all between 0.5 and 1 meters in diameter. Below this slope, the masses have constructed a large settling basin that they use to catch the water and trap the sand. In the past year a total of 19 cubic meters of sand has silted up, which amounts to an alarming 47.5 cubic meters that has been scoured away per mu (and, in fact, this was primarily parent material).

The thickness of the soil layer, the water-storage capacity of the soil, the number of days of drought resistance and the agricultural crop yields vary with the different earth platforms. The conditions we surveyed at the Fourth Production Team's Wuchang Mountain in the Third Production Brigade of Tai'an Commune, Tongnan County, are as illustrated below:

Platform Level	Soil Moisture Content (%)	Soil Layer Thickness (m)	Soil Unit Weight ( $t/m^2$ )	Soil Water-Storage Capacity ( $m^3/mu$ )	Number of Days of Drought Resistance	Fresh Yam Output (Jin/mu)
Platform One	19.0	0.7	1.20	106.5	12	3,000
Platform Two	16.2	0.5	1.23	66.5	8-10	2,000-2,500
Platform Three	14.9	0.3	1.34	39.9	5	approx. 1,500
Platform Four	13.9	0.2	1.23	22.3	2-3	below 1,000

This completely explains the cause of low drought-resistance and low yields on hillside slopes.

Looking at the province as a whole, the area of soil and water erosion is rapidly expanding and the area of cultivated land is gradually shrinking. The more we cultivate slope lands, the more infertile and the thinner they become. Good fields are buried by silt, pools and ponds are silted up and drought and flood disasters increase dramatically. For example, at the inception of liberation there were 6.03 million mu of paddy fields in Yibin Prefecture, and 5.8 million mu of this area was planted in an average year. By the beginning of the 1980s there were only 5.47 million mu of paddy fields there, and around 5 million mu of this area was planted in an average year. In 1957 there were 105 million mu of cultivated area in the province. This had declined to 102 million mu in 1961, to 100 million mu in the 1970s and by 1981 it had dropped to 98.6 million mu. Within 24 years the reduction in cultivated land was equivalent to twice the cultivated area of Neijiang Prefecture. Of course, the use of land for capital construction and other factors also play a part in the reduction of cultivated area, but soil and water erosion is a major cause. Siltation of water conservancy projects is also very alarming. According to Water Conservancy Department calculations, silt deposits amount to 16 million cubic meters per year in Sichuan--equivalent to losing one medium-sized reservoir per year. According to records, the Sichuan Basin experienced flood disasters in 21 of the 31 years from 1951 to 1981--a frequency of 68 percent. If this is analyzed according to different decades, the following facts are revealed: there were four flood-years during the 1950s, this rose to seven flood-years in the 1960s and each of the years so far in the 1980s have been flood years. If we look at droughts, we find them to be even more frequent: according to records, in the 2,169 years from 193 B.C. to 1976 droughts have occurred in Sichuan a total of 326 times, or an average of 1 every 6.65 years. If we look at different segments of time from the Han and the Tang to today, the situation is such that the closer we draw to modern times, the more frequent the occurrences of drought, the shorter the intervals between them and the more severe the damage. For example, in the Han and Tang periods, from 193 B.C. to the 10th century, droughts occurred an average of once every 79.5 years. During the Song and Yuan periods (the 11th century to the 13th century) the average was once each 8.8 years, for the Yuan and Ming (the 14th century to the 17th century) it was every 4 years, in the Qing Dynasty (using the 18th and 19th centuries) it was every 1.8 years and in the 76 years from 1901 to 1976 the average was one drought every 1.08 years.

## II. The Type, Characteristics and Causes of Soil and Water Erosion in the Sichuan Basin

With regard to the types of soil and water erosion, the Sichuan Basin experiences sheet erosion, gully erosion, river erosion, landslides, mountain landslips, mud-rock flows and erosion of parent material. The

characteristics of soil erosion are as follows: (1) Sheet erosion is more severe than gully erosion. Sheet erosion is the primary type of erosion in the Sichuan Basin, accounting for two-thirds of the eroded area. The reason that gully erosion is not severe is that the basin soil layer is thin, so that when a certain degree of sheet erosion is reached, the parent rock is exposed. The parent rock is far more erosion-resistant than is the soil, and consequently the development of gully erosion is quite slow. (2) Erosion is more severe on cultivated land than on wild land. This is due to the frequent tillage of cultivated land, the looseness of the soil and the fact that the crop canopy density is not very great during the rainy season. Add to this the slope of the cultivated land, and the cultivated land becomes the base for basin soil and water erosion. (3) Erosion is more severe on sloped land than on flat land. (4) Erosion is more severe on hilly land than on mountain land. This is due to the following facts: on hilly land the population density is great, there is a high rate of land reclamation for cultivation, there is a large proportion of arid land, vegetation is sparse, the erosion resistance of the parent material is weakened, rainfall is concentrated and the intensity of precipitation is great. Hilly land is frequently cultivated from the foot of the slope to the top of the hill, so that there are treeless hills and swatches of scarlet everywhere. (5) The erosion of parent material is grave, and the erosion of parent material in the Suining Team is particularly conspicuous. In the purple-earth region developed from Suining Team parent material, funnel-shaped gullies riddle the hillmass. The result is that the topography has been torn up, the area of cultivated land has decreased and the soil, owing to the lack of a supply source for solid matter, has become "thin, infertile, coarse and dry." (6) The type of erosion varies with the area: in the mountainous areas on the edge of the basin, landslides, mountain landslips and mud-rock flows occur easily; in the purple-hill areas, the primary factors are the red rock strata, the weakened lithologic character, the joint development and the easy occurrence of sheet erosion; in the yellow-soil areas, gully erosion is considered the dominant factor; in flatland areas, inundation, siltation and scouring are considered the major pattern; and along the river banks, river-bank collapse, inundation, and siltation easily occur.

People, because of their imprudent production activities, are the dominant factors giving rise to soil erosion. The amount of area in Sichuan that has a surface slope of greater than 5 degrees, and is thus possibly subject to erosion, represents approximately 85 percent of the total area of the province. Hillside slope lengths are generally around 100 meters, with the long ones reaching more than 800 meters and the short ones measuring 50-plus meters. The steeper the slope gradient or the longer the slope length, the more severe the soil and water loss. Gully density<sup>3</sup> is generally around  $2.5 \text{ km/km}^2$ , with a maximum density of  $6 \text{ km/km}^2$  and a minimum density of  $0.5 \text{ km/km}^2$ , and is the fifth highest in the nation. The relative height difference in province relief amounts to 7,390 meters, and this is in third place nationally. Added to this

is the weak, fragile lithological character of the purple rock, which facilitates weathering so that the soil is eroded very easily. In the Sichuan Basin rainfall is concentrated in the summer season, most of it produced by storms. Every year, storms in the basin generally begin in succession from east to west, and later they end gradually from west to east. Rainfall is quite frequent in the five months from May to September, and it is most frequent in July and August.

There are two heavy storm regions in the basin: one of these extends southwest from Beichuan, Jiangyou, Anxian and Mianyang in the Northwest and passes through Wenjiang Prefecture and the eastern portion of Ya'an Prefecture until it reaches the southern portion of Leshan Prefecture; the other storm region is that of Bazhong, Tongjiang and Wanyuan in the northeast portion of the basin. Beichuan, Anxian, Ya'an, Hongya and Emei are the areas of the basin in which storm-caused flooding, waterlogging and soil loss most frequently occur. Deluges and storms are concentrated in the months from May to September and appear most frequently in the summer (from June to August). Consequently, looking at the basin as a whole, the peak period of soil and water erosion appears also in the high-rainfall summer months. Correspondingly, some disasters, such as flooding, landslides, mountain landslips and mud-rock flows, also happen in the summer and fall. Imprudent human production activities, such as felling forests, destroying grasslands, building dykes to reclaim riverbottom land, bringing steep slopes under cultivation, building barriers in rivers and so forth, have intensified soil and water loss and aggravated natural disasters. The forest cover in Sichuan province, which was 19 percent at the beginning of liberation and fell to 9 percent thereafter, has through hard work risen to the current level of 13.3 percent. Large-scale felling of forests for conservation of headwaters in the north of Sichuan has already brought about grave consequences manifested first of all in meadow and bush invasion; second in an increase of dry river valleys; third in weakened water conservation functions; fourth in greatly aggravated soil and water erosion, breakdown, landslides and mud-rock flows; and fifth in climatic deterioration and frequent natural disasters. In 1961, comrade Tan Qilong [6223 0796 7893], after observing the particularly bad flooding in Sichuan, said the following: "Tracing the reasons why flooding in Sichuan extends to this broad an area and why the losses are this great, the major causes are that the forests on the upper reaches of the Chang Jiang are suffering grave deterioration and soil and water erosion is severe. As soon as there is a storm, torrents of water run down the mountain, flow swiftly on for a thousand li and cannot be held back. We must protect the forests, make great efforts in afforestation, retreat from cultivation to restore the forests, adjust the internal composition of agriculture and preserve the ecological balance. We must never again do something so stupid as to 'eat the food of our ancestors and create evil for our descendants.'" Why is it that the forest can play such an enormous role? It is because the forest ecological system is the most important ecological system on the globe

and holds a decisive position in the earth's ecological environment. The air that man cannot exist without even for a moment is primarily manufactured by the plant kingdom. The plant kingdom, particularly the forests, absorbs carbon and give off oxygen in the growth process.

### III. The Path to Water and Soil Conservation

1. Strive to disseminate and heighten recognition, by all levels of leadership and by the vast number of cadres and masses, of the importance and urgency of water and soil conservation.
2. Resolutely protect the forests, prevent destruction and be strict and impartial in the legal system.
3. Emphasize control and fan out from single points to larger areas. From the perspective of China's experiences, the effective methods of water and soil conservation are to take small river valleys as the control unit; integrate biological and engineering measures, with emphasis on biological measures; and control gullies and slopes simultaneously. Reform of slope cultivation has an enormous effect on soil and water conservation. We should transform slope land into terraced land, restore and construct slope drainage on cultivated slope lands and make sure that there are ridges on the ground, pathways for the water, encasements for the sand and ponds for water storage. At the same time, we must put into effect the transverse slope-cultivation method. Forest protection, afforestation and grass planting are beneficial measures that we must emphasize unremittingly for the long term in order to protect the environment, conserve water, preserve water and soil and regulate climate.

#### FOOTNOTES

1. The erosion modulus is the number of tons of soil and water lost annually per square kilometer.
2. This is converted on the basis of a unit weight of 1.25 (tons/cubic meter).
3. Gully density is the total length of all gullies per square kilometer of area. It is frequently used as a standard for judging soil and water erosion.

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## ENVIRONMENTAL QUALITY

### RESEARCH ON ENVIRONMENTAL QUALITY IN MOUNTAINOUS REGIONS

Chengdu SICHUAN RIBAO in Chinese 25 Jun 84 p 2

[Article: "Develop Research to Evaluate Environmental Quality in Industrial Cities in Mountainous Regions--The Dukou City Environmental Protection Bureau Links Up for Cooperation with Institutions of Higher Education and Scientific Research Units within the Country"]

[Text] The Dukou City Environmental Protection Bureau has linked up with Nanjing University, the Chinese Academy of Environmental Sciences and other institutions of higher learning and scientific research units to carry out research for the first time in China on evaluating environmental quality and atmospheric modeling in mountainous areas, and they have attained obvious successes.

Dukou City is a treasurehouse of extremely abundant and concentrated resources in China. Environmental pollution in the city has become increasingly severe following the development and utilization of mining resources. The Dukou City Environmental Protection Bureau began cooperating with Nanjing University in 1979 to develop research for comprehensive evaluation of environmental quality in Dukou City. Later, they also linked up with Zhongshan University's Environmental Sciences Institute, the Ministry of Metallurgical Industry Construction Research Academy Environmental Sciences Institute and other units, and invited specialists from Beijing Normal University, the Hebei Geographical Institute and the Ministry of Construction's Environmental Protection Bureau to serve as advisors. In the past 5 years, more than 100 specialists, professors and S&T workers have participated in and led on-site work.

Specialists and professors in all disciplines at Nanjing University took into consideration Dukou City's complex natural conditions and industrial characteristics centered on mines, metallurgy, electric power and construction, and formulated comprehensive design programs and work procedures for a comprehensive evaluation of environmental quality in the city. They applied techniques and methods from home and abroad and made progress in many areas.

In the area of evaluating the environmental quality of surface water, the research showed that, although the Dukou section of the Jinsha Jiang is polluted by waste water and sludge, because the flow rate of the Jinsha Jiang is large and it has a strong self-cleaning ability, the polluted water during

the dry season still only amounts to 1 percent of the total flow rate of the river water. Heavy metal elements, radioactive elements and organic pollution are below national standards. Strengthened management of water treatment plants should be sufficient to guarantee safe water for household use. Since 1981, the quality of water from water treatment plants has met national public health standards, and there has been an obvious drop in the occurrence of epidemic diseases.

In the area of evaluating atmospheric environmental quality, the main source of atmospheric pollution, the main pollutants and their influence on human health was determined, and scientific data was provided for pre-evaluation and comprehensive prevention of atmospheric pollution from the second period of the Pan Steel Mill project when it goes into operation.

The results of research on the "Comprehensive Evaluation of Environmental Quality in Dukou City" that was carried out by the city's Environmental Protection Bureau in cooperation with institutions of higher education and scientific research units in recent years received a provincial award for major S&T successes in 1982. The "Model for Atmospheric Pollution Dispersion in Dukou City and Applications" and the "Research on Modeling the Migration and Dispersal of Suspended Pollutants in the Dukou Section of the Jinsha Jiang" both received third place provincial awards for major S&T successes in 1983.

There has been an increase in the number of units inside and outside the province that have linked up with the city's Environmental Protection Bureau for cooperation, and research on comprehensive prevention of environmental pollution in Dukou City is now being developed in a comprehensive manner.

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## ENVIRONMENTAL QUALITY

### REGULATIONS ON AFFORESTATION IN SICHUAN PUBLISHED

Chengdu SICHUAN RIBAO in Chinese 3 Jul 84 p 2

[Regulations announced by the 2nd Session of the Sixth Sichuan Province People's Congress: "Provisional Regulations on Afforestation in Sichuan Province"]

[Text] Announcement of the Sichuan Province People's Congress:

The "Provisional Regulations on Afforestation in Sichuan Province" were passed during the 2nd Session of the Sixth Sichuan Province People's Congress, and are now being announced and put into force.

[Signed] Chairmanship Group of the 2nd Session of the Sixth Sichuan Province People's Congress, 28 June 1984.

#### Chapter I. General Principles

Article 1. Afforestation in Sichuan is a magnificent cause for improving the natural ecological environment in our province, for building socialist material civilization and spiritual civilization, for improving the people's standard of living and enhancing the quality of our nationality, and for creating wealth for future generations. It is an important strategic policy that concerns achievement of quadrupling the total value of yearly industrial and agricultural output by the end of the century. In order to afforest the entire province as quickly as possible, we have integrated actual conditions in Sichuan to formulate these regulations according to the national constitution and related laws and administrative regulations.

Article 2. Achieving the afforestation of Sichuan involves planting trees, grass, bamboo and flowers to expand green vegetation on the land in all possible areas of the province according to local conditions. We must actively develop and use timber forests, economic forests, fuel forests, shelter forests and special-use forests, as well as all types of superior pasture grass and other types of grass. Conscientiously protect and rationally use forest and grass resources, and improve their ecological, economic and social benefits.

Article 3. Mobilize all people in the province to actively engage in afforestation movements. The principles behind afforestation movements are to rely on the broad masses in urban and rural areas and all lines of endeavor, to promote many forms of contractual responsibility systems, and to have individuals, collectives and the state work together in unison to speed up afforestation.

Article 4. All levels of the people's government should conscientiously strengthen leadership of afforestation work and take responsibility for afforestation in the area under their jurisdiction. Principal leading cadres of the government should take responsibility for afforestation in their area. This should be an important aspect to evaluate government work and assess the achievements of principal leading cadres in their official duties.

Afforestation committees at the county level and above should unify management of afforestation work in their area. They should carry out guidance, coordination, supervision and inspection of all lines of activity. Afforestation committees should have an administrative structure to take responsibility for dealing with day to day work.

The forestry, agriculture and animal husbandry, urban construction, and other departments at all levels of the people's government should jointly do good afforestation work according to their obligations and through close coordination.

## Chapter II. Planning

Article 5. All barren mountains, barren hillsides, wasteland, barren beaches and areas with few trees in rural areas, barren areas around villages, along roadways, around bodies of water and around houses that are suited to forests and grass, empty areas in cities and towns suited to forests and afforestation zones specified in comprehensive urban plans are lands that should be afforested.

Article 6. Based on the principles of adaptation to local conditions and being concerned with results, the people's government at all levels should formulate comprehensive plans, regional plans and enforcement plans for afforestation in the area under their jurisdiction. All the people of the province should implement them according to the stipulated standards and requirements.

The afforestation plans formulated by all levels of the people's government should be approved through discussion by the People's Congress at the same level or its Standing Committee. The conditions of progress in implementing afforestation plans should be reported to the People's Congress or its Standing Committee.

Local people's governments should make plans for afforestation in mountain ranges that cross county boundaries, along river banks, areas around lakes and in water conservation construction areas in accordance with the unified

arrangements of higher levels of the people's government. Afforestation along rail lines and highways should be planned by the responsible departments and local people's governments have supervision and inspection rights.

Afforestation plans should closely integrate soil and water conservation, waterway control and environmental protection.

**Article 7.** During this century, the forest cover rate in Sichuan should reach more than 20 percent, and the area planted with grass should reach about 10 percent of the area suitable for grass. The forest cover rate in counties (cities and districts) in flatland areas, hilly areas and mountainous areas should reach about 10, 20 and 40 percent, respectively. County-level people's governments should determine the forest cover rate that should be attained based on the area suited to forests in the region under their jurisdiction, and they should determine the time period for achieving afforestation.

Afforestation in cities and towns should be included in comprehensive urban plans to maintain their historical characteristics and natural scenery, encourage three-dimensional afforestation, and beautify the cities and towns. The forest cover rate of cities, towns, factories and mines should generally be above 30 percent. Those with the conditions should strive to attain 50 percent. The special use of afforested areas for newly-constructed units should be implemented according to related decisions of the state.

### **Chapter III. Rights and Responsibilities**

**Article 8.** Land ownership rights will remain unchanged for all land that is legally stipulated as being collectively-owned or state-owned (that is, owned by the whole people) in urban and rural areas that should be afforested, without regard to whether it has been given to the peasants as private hillsides, contracted out to whatever unit or individual for management, or firmly turned over to any unit to take responsibility for planting trees and grass.

**Article 9.** All collectively owned land suitable for afforestation that can be managed easily by the masses should be divided up and turned over to the peasants as private hillsides for planting trees and grass in accordance with the wishes and administrative abilities of the masses. County-level people's governments should give a certificate for the use of private hillsides, and they should be administered by the peasants for long periods; and permit the rights to be inherited and permit them to handle the products themselves. Rights over growing forests and grass can be transferred to others at market prices.

**Article 10.** After demarcating private hillsides, the remaining collectively owned land that should be afforested can come under unified planning by the collectives as responsibility hillsides and contracted out to the peasants for planting trees and grass. State-owned land that should be afforested can serve as responsibility hillsides and contracted out to the employees, peasants or herdsmen in local forests or pastures.

The period of contractual responsibility can be 30 years, 50 years, or more than 50 years. Contractual responsibility rights can be inherited, transferred with agreement of the contractor or put under integrated administration by the contractor. The products of private hillsides should be dealt with contractually, and rights over growing forests and grasslands can be transferred at market prices.

Public bidding is permitted in areas with many barren hillsides. Any unit, individual or group of households inside or outside the province can adopt integrated administration, compensated trade or other forms to develop forestry and animal husbandry. The lumber and bamboo obtained by the bidding units should not be deducted from state plan distribution indices.

Article 11. Private hillsides and responsibility hillsides should be afforested within the stipulated period. A fee for delayed afforestation should be collected for places that have not been afforested by the end of the time period, and the land can be recovered by the owner. County people's governments will determine the afforestation periods and methods for collecting and using fees for delays in afforestation.

Article 12. Develop specialized forestry households, specialized households for planting grass and raising livestock, and economic coalitions for forestry and planting grass for livestock raising. Encourage them to establish forestry and animal husbandry commodity production base areas and carry out small river basin control. Specialized households can contract as individual households, coalitions of households or they can seek partners. There are no limits to contractual areas, and they can cross over regions. Assistants also can be taken on. The related departments should provide assistance in information, technology, improved varieties, shipping and sales, credit and other areas.

Article 13. Pastoral regions should determine utilization rights for pasture to establish and perfect a pasture utilization and management responsibility system. Pastures should be contracted to households or coalitions of households. They should be established, managed and utilized by the contractors. There should be no change for a long period, and the rights can be inherited. They can also be permitted to voluntarily engage in joint administration. Encourage herdsmen to carry out capital construction on pasture lands, to use improved grass varieties, to improve grass yields and to maintain a balance between grass and livestock.

Article 14. Coal, papermaking and other industrial and mining enterprises that consume large amounts of timber should manage it themselves or jointly administer it with those having property rights over the hillsides. Establish raw timber base areas or adopt other forms to develop forestry. The timber and bamboo that is obtained cannot be deducted from state distribution supply indices. Forestry departments should make arrangements for forests and provide scientific and technical assistance.

Article 15. Responsibility for afforestation along rail lines, highways and river banks:

Railway departments have contractual responsibility for afforestation along rail lines.

Highway departments are responsible for roads at the county level and above. They can be planted and managed by the highway departments themselves, or the highway departments can supply seedlings and rural people's governments can organize the masses in the area to contract for planting and managing the trees. Or, they can adopt other feasible and effective measures for afforestation.

District and township roads can be the responsibility of districts and towns, with unified planning and sectioning to contract with the local masses. The trees belong to whoever plants them.

The local people's governments are responsible for the areas along river banks and around lakes. They can be managed in the same manner as methods for afforestation along prefecture and township roads. Responsibility for reservoirs and irrigation management districts can be contracted to project management units or the units that use them.

Article 16. Afforestation in cities and towns can be the responsibility of local urban construction, parks or forestry departments. Factories, mines, enterprises, organizations, schools, military posts and other units should set afforestation deadlines. Urban residents can plant trees and flowers in free courtyards, and whoever plants them is the owner.

Article 17. Compulsory tree planting tasks should be completed according to stipulations, with guarantees for planting and survival. Compulsory tree planting cannot be substituted for state plan afforestation tasks and cannot receive afforestation subsidies.

Units and individuals must be encouraged to plant commemorative trees on commemoration days and create commemorative forests. Parks and forestry departments should provide assistance.

#### Chapter IV. Scientific Tree Planting and Management

Article 18. Greatly strengthen scientific research and education in afforestation, rely on advances in S&T to promote the cause of afforestation. The curriculum of middle and elementary schools should include knowledge of afforestation.

Planting trees and grass on large expanses and their management and protection should be carried out according to technical regulations. Technical regulations are formulated by professional management departments and extended for technical guidance.

Article 19. Improved varieties should be selected for planting trees and grass. Forestry, agriculture and animal husbandry, and parks departments should make great efforts to select and breed local improved varieties. Actively bring in improved varieties from outside, do good work in S&T applications of improved varieties and nursery regulation to guarantee the needs

of afforestation. Regional base areas for the selection of improved varieties and experimental breeding base areas should be established in a planned manner. Develop specialized households for breeding improved varieties.

Article 20. Establish sufficient numbers of nurseries to meet the needs of afforestation. Implement contractual responsibility systems for raising seedlings and develop specialized households for raising seedlings. The state and collectives should assist the masses in raising seedlings.

Urban and rural parks departments should establish the needed specialized nurseries. Railway, highway and other departments, as well as factories, mines, enterprises and other units with large afforestation tasks should run their own nurseries according to their requirements.

State-run nurseries are not permitted to change the direction of their administration or reduce the area for raising seedlings without authorization. No unit is permitted to encroach upon state-run nurseries.

Article 21. Manage and protect forest and grass resources, seal off mountains for afforestation in a planned manner, prohibit destruction of green vegetation and consolidate achievements in afforestation. National laws and regulations protecting forests, pastures and parks must be conscientiously implemented, and violators must be investigated. Cutting of forests must be carried out in accordance with state directives. Cut-over areas should be replenished as soon as possible.

The intercutting of trees for tending forests, public health cutting, replenishment cutting and pruning in areas along railways and highways, along river banks, in reservoir and irrigation canal management districts, and in scenic areas and public forests in cities and towns must be done in accordance with the regulations of official administrative departments.

Cutting in areas that are off-limits to cutting is prohibited. Private cutting of bamboo and bamboo shoots in natural protection districts is prohibited.

Famous and ancient trees should be registered with official administrative departments of the people's government at the county level and higher. Archives should be set up and responsibility for administration and protection should be established so that they are managed well. Whenever they must be felled due to special circumstances, they should follow stipulations and report this to official administrative departments for approval.

Protect grass resources, rationally utilize natural pastures and actively plant improved varieties of forage grasses. Gradually transform pastures, grassy hillsides and slopes. Encourage the use of winter fallow lands, crop rotation lands, orchards and bodies of water suitable for developing aquatic plants to plant forage grasses, green manure and aquatic plants to expand and improve grassy vegetation.

Disputes over mountain forests or pastures must be investigated and dealt with quickly. Before the dispute is solved, neither side should cut timber or forcibly graze livestock in the area under dispute.

Article 23. Reclamation and the planting of farm crops on land with a slope greater than 25° is prohibited. Land with a slope greater than 25° that was privately reclaimed and put into cultivation by peasants following implementation of the system of contractual responsibility by households for output quotas should be removed from cultivation and planted with trees and grass within a period of 2 to 3 years. All land not so planted within this period will be recovered without compensation and distributed to capable peasant households for planting trees and grass. Land that was reclaimed and put into cultivation prior to implementation of the system of contractual responsibility by households for output quotas should be demarcated and the conditions actively created for gradually removing it from cultivation and planting trees and grass.

With approval by the related departments, green vegetation damaged because of soil removal, rock extraction, quarrying, accumulation or other reasons should be restored by having those who did the damage plant trees and grass, or there can be a corresponding payment and the local people's government can take responsibility for afforestation.

All units that discharge pollutants and damage vegetation should adopt technical measures in accordance with environmental protection laws to prevent damage to vegetation.

Adopt the pattern of integrating specialized contingents, specialized personnel and mass organizations to establish a complete forestry and urban afforestation management and protection organization, demarcate regions of responsibility for management and protection, and implement responsibility systems for management and protection.

Strictly prevent fire disasters and damage to forests and grasslands from diseases and pests. During periods of high risk from fire disasters and damage from diseases and insect pests, strengthen forecasting and inspection tours and add prevention measures. Fire damage should be quickly salvaged.

#### Chapter V. Funding

Article 25. Afforestation funds should come mainly from relying on one's own efforts. The people's government at all levels should appropriate a portion of capital from local finances each year to assist forestry. The capital for afforestation that is appropriated by the state or collected by localities should be used entirely for afforestation according to the specified uses, and cannot be put to other uses. Encourage compensated assistance and developmental loans.

Forest raising expenses and afforestation funds set aside by coal, papermaking, communications and other departments for building raw materials base areas that as stipulated must be placed special bank accounts and supervised by financial departments and banks so that it is used for forestry construction.

A specified forest raising fee should be paid for lumber, bamboo and forestry sideline products placed into the sphere of circulation. Concrete payment methods and uses will be decided upon by the provincial people's government.

Article 26. The seedling fees and administrative fees required for compulsory afforestation are the responsibility of the unit that owns the forest. Those units with heavy afforestation tasks, funding problems or a real inability to assume the entire cost should have their expenses paid at the discretion of financial departments at each level depending on jurisdictional relationships.

#### Chapter VI. Rewards and Punishments

Article 27. Establish a social custom of planting and loving trees and grass. Those regions, units and individuals that conscientiously implement these regulations and make superior achievements in afforestation work should be commended and rewarded. Regions and units with outstanding achievements can be awarded the title of "Afforestation District", "Afforestation City", "Afforestation Unit" or "Afforestation Township", respectively, by provincial, city, autonomous prefecture, or county (city and ward) people's governments or by regional administrative offices. Cadres, S&T personnel, workers, peasants, herdsmen, urban residents and members of the People's Liberation Army who have made outstanding achievements can be awarded the title of advanced worker or labor model by the province, city, autonomous prefecture, or county (city and ward) people's governments or by regional administrative offices. They also can be promoted or given material awards.

Article 28. For those who violate these regulations through the actions listed below, official organizations and units can criticize and educate, take administrative disciplinary measures, or impose economic sanctions on those who are directly responsible, on official personnel or on instigators according to the severity of the circumstances or the degree of responsibility. Criminal responsibility should be determined according to law for criminal actions:

- 1) Actions involving theft of trees through cutting or denudation of forests, destruction of pastures or destruction of park vegetation, or laxity in prevention.
- 2) Serious irresponsibility or failure to carry out the obligations stipulated in these regulations that causes damage to the cause of afforestation.
- 3) Squandering, wasting, embezzling or misappropriating afforestation funds.
- 4) Those who steal or denude forests, damage pasturelands, destroy park vegetation or destroy seedlings or young trees.

- 5) Those state-run and collective timber cutting units that cut in excess of plans, cut in violation of cutting regulations, or do not replant cleared land within the specified period.
- 6) Those who violate fire prevention stipulations and cause fire disasters that destroy forests, pasturelands or parks.
- 7) Those who reclaim land on slopes greater than 25° for planting crops without authorization after the promulgation of these regulations.
- 8) Those who beat up personnel carrying out forest and grassland management and protection tasks.
- 9) Any other violations of these regulations that cause damage to the cause of afforestation.

**Article 29.** Those who deliberately set fires to burn down forests, grasslands or parks; those who organize the masses for forcible disorganized cutting and denudation; those who pilfer livestock or cut trees and wantonly damage forests, grasslands or park vegetation; those who disable or kill personnel who are implementing forest and grasslands management and protection personnel through beatings all should be punished severely.

**Article 30.** Public security and judicial organs should earnestly investigate and try cases of destruction of forests, grasslands and park vegetation or other activities that destroy vegetation and violate these regulations in the region under their jurisdiction.

**Article 31.** The provincial Forestry Department, Agriculture and Animal Husbandry Department, and Urban and Rural Construction Environmental Protection Department can join with related departments to formulate concrete methods for administrative rewards and punishments as stipulated in these regulations and implement them after submitting them to the provincial people's government for approval.

#### **Chapter VII. Supplementary Articles**

**Article 32.** These regulations go into effect on the day they are announced. Any decisions related to afforestation promulgated in the province in the past that conflict with these regulations should be implemented in accordance with the regulations. Contracts and agreements that were signed according to previous decisions will remain in effect. They can be changed in accordance with these regulations with the agreement of both parties.

**Article 33.** People's Congresses and their Standing Committees in autonomous prefectures and autonomous counties can integrate with concrete local conditions to formulate certain accommodations or supplementary decisions according to the principles in these regulations after submitting them to the standing committee of the provincial people's congress for approval.

**Article 34.** These regulations are to be implemented by organizations of the people's government at all levels.

## ENVIRONMENTAL QUALITY

### SICHUAN'S AFFORESTATION REGULATIONS EXPLAINED

Chengdu SICHUAN RIBAO in Chinese 3 Jul 84 p 2

[Speech by Liu Haiquan [0491 3189 3123], Vice Chairman of the Sichuan Province People's Congress Standing Committee and Chairman and Member of the Sichuan Province People's Congress Standing Committee Agriculture Commission at the 2nd Session of the Sixth Sichuan Province People's Congress on 24 June 1984: "An Explanation of the 'Provisional Regulations on Afforestation in Sichuan Province (Draft)'"]

[Text] Representatives:

The Sichuan Province People's Congress Standing Committee has entrusted me with explaining the "Provisional Regulations on Afforestation in Sichuan Province (Draft)." The "Provisional Regulations on Afforestation in Sichuan Province (Draft)" were revised after repeated discussion on the basis of the need to build socialist material civilization and spiritual civilization in Sichuan. Since the 3rd Plenary Session of the 11th CPC Central Committee, the Party and state have paid great attention to the cause of afforestation, and have put forth a series of important policies and promulgated quite a few laws and regulations. Sichuan has resolutely implemented the measures stipulated for adoption in these policies and laws. In combination with several years of practical experience, this has created the conditions and provided a foundation for us to formulate provincial afforestation regulations. In order to more effectively mobilize the people of all nationalities in the province to accelerate afforestation, it was entirely necessary to promulgate regulations such as the "Provisional Regulations on Afforestation in Sichuan Province (Draft)." After a year of investigation, draft preparation and revision, the provincial Afforestation Commission put forth the "Provisional Regulations on Afforestation in Sichuan Province (Draft)" in April of this year, and the provincial People's Government turned them over to the 6th Session of the Sixth Sichuan Province People's Congress Standing Committee for discussion. After being revised in consideration of opinions expressed during the discussion, they were issued to the standing committees of the people's congresses in each city, autonomous prefecture and county, to official prefectural administrative offices, to related departments at the provincial level and to scientific research units and some colleges, universities and vocational schools in the form of a "draft for soliciting opinions." Opinions were solicited widely and discussion meetings were held on several

occasions with participation by comrades from scientific research units and professional departments. We used more than 1,200 suggestions from all areas and departments to revise them again and they were discussed again by the 7th Session of the Sixth Sichuan Province People's Congress Standing Committee and revised into the "Provisional Regulations on Afforestation in Sichuan Province (Draft)." The Standing Committee considered the fact that these regulations were an important law in Sichuan and decided to submit them to the 2nd Session of the Sixth Sichuan Province People's Congress for discussion. During the process of examining and revising the "Provisional Regulations on Afforestation in Sichuan Province (Draft)," the guiding ideology used by the Standing Committee was to fully recognize the great importance and urgency of the afforestation movement in order to strengthen the understanding of the people of all nationalities and cadres in the province for managing the cause of afforestation according to the law. The "Decision Concerning the Development of a Compulsory Afforestation Movement for All the People" of the 4th Session of the Fifth National People's Congress stipulates that "planting trees and afforestation to make the motherland green is a magnificent cause of building socialism and creating wealth for future generations, and it is an important strategic measure for controlling mountains and rivers and for protecting and improving the ecological environment." The "Notice Concerning Intensive and Solid Development of the Movement to Afforest the Nation" of the CPC Central Committee and the State Council points out that "afforesting the motherland is the first item of work for achieving excellent cycles in the natural ecosystem, and is a great strategic question for achieving a quadrupling of the total value of yearly industrial and agricultural output by the end of this century." We must make use of this high-level ideology to understand the importance and urgency of afforestation, and we also must use this high-level ideology to formulate, propagandize and implement our afforestation regulations, and to make afforestation truly the first item of work for achieving excellent cycles in the ecosystem. For various historical reasons, many forests and grasslands in Sichuan have been destroyed. There is serious soil erosion and continual degradation of the ecological environment. Since the 3rd Plenary Session of the 11th CPC Central Committee, Sichuan has resolutely implemented the policies and decisions of the party and the state concerning the acceleration of afforestation construction, widely developed mass movements for tree planting and afforestation, and there already have been obvious results. There are still some areas, however, where the leading ideology has been slow to change, where afforestation work has been done poorly, and where excessive cutting is still a very serious problem. Forest resources are still continually declining and the ecological environment is continuing to be degraded. If we continue to stress cutting while neglecting afforestation, this is not only unfavorable for construction in mountainous regions, but also endangers stable development of agriculture in the basin. The consequences are unthinkable. We must see the seriousness of this problem. We absolutely cannot ignore it. The Central Committee pointed out: "The basic route to transforming vicious cycles in the ecosystem into excellent cycles is to plant trees and grass and to increase the green vegetation that covers the nation's soil." This involves long-term urgent and arduous construction and cannot be postponed or put off. We must take action early to accelerate the pace and widely mobilize the people of Sichuan to intensively and solidly develop an afforestation movement through the acceleration of afforestation, and we must

build the rural areas of Sichuan into strong forestry and animal husbandry base areas that are more than self-sufficient in grain for building socialist modernization and an excellent ecological environment. We must strive to "enrich the people" and "raise statuses," and make a contribution to achieving the overall goals proposed by the 12th CPC Congress.

To achieve afforestation as quickly as possible in Sichuan, we must expand our field of vision and further clarify the content and scope of afforestation. The CPC Central Committee and the State Council have pointed out that "afforestation of the motherland involves planting trees, grass and flowers according to local conditions and expanding the green vegetation that covers our nation's soil in every possible area of the nation." For a long time, there has been a superficial understanding that considers afforestation to be merely planting trees, meaning that there is only one type of afforestation and afforestation method. We not only must actively develop the use of timber forests, but should also make great efforts to develop economic forests, fuel forests, shelter forests and special use forests. Forests play a dominant role in achieving natural ecological equilibrium, and planting trees is an important measure for afforestation. This must be affirmed. However, we cannot ignore the important role of grasses in increasing the vegetation on exposed land relatively quickly, preventing serious soil erosion, and promoting the development of animal husbandry and aquaculture. With a focus on protecting and rationally using natural grass resources, we should have key areas for artificially planting grass and for gradually improving existing pasturelands and grassy hills and slopes. We not only must plant trees and grass, but also must plant flowering trees and grasses to beautify urban and rural areas and to improve the living and working environment. We must "rely on the masses and all lines of endeavor in urban and rural areas to promote many forms of contractual responsibility systems, so that individuals, collectives and the state work together in unison to accelerate the achievement of afforestation." In rural areas, with a focus on household administration, we should make great efforts to assist in developing specialized households and economic coalitions. In urban areas, we should support specialized parks contingents to integrate themselves with the masses and implement contractual responsibility systems according to area and section or according to unit and courtyard. Whether in urban or rural areas, we must mobilize the masses and all lines of endeavor to work together in afforestation.

I will explain some questions below:

#### 1. The Question of Organizing Leadership.

Afforestation of the motherland is a basic national policy of our state. This is because a developed forestry industry and an excellent ecological environment are important indicators of a wealthy and strong nation, a prospering nationality and a civilized society, and we are an important part of socialist modernization and construction. The afforestation of Sichuan is a very difficult task that will require a long time. It will be impossible without enormous effort. The key lies in assuring that leading cadres at all levels are quite determined in regard to the cause of afforestation and truly treat afforestation as an important matter. Therefore, we must place the

responsibility for afforestation on the shoulders of leading cadres at all levels. An example is Article 4 of the regulations, which stipulates that all levels of the People's Government should be responsible for achieving afforestation in the area under their jurisdiction: "All main leading cadres of the government should be responsible for afforestation in their area." It also stipulates that "this should serve as an important component for evaluating government work and examining the official successes of main leading cadres." There was a basis for making this decision. Article 27 of the Constitution stipulates that all state organizations should implement work responsibility systems and examination systems for work personnel. The CPC Central Committee and State Council reaffirmed in March of this year that the responsibility for planting trees and grasses to afforest the motherland should be placed on the shoulders of the leading cadres of party committees and at all levels and all units. Moreover, it makes failure or success in completing or exceeding afforestation tasks with guaranteed quality and quantity one of the major components for examining cadres. In some counties with very poor natural conditions, because the main leading cadres were farsighted, personally concentrated on afforestation and implemented an inspection system for all levels, the appearance of the countryside was transformed within a decade or so. This shows that the decisions of the draft regulations in this area are essential. Since the cause of afforestation is an extremely urgent and arduous task that involves long-term construction, afforestation committees and leadership groups should not only be long-term organizations, but should also strengthen their organization and leadership to live organizations that manage affairs well.

## 2. On the Question of Afforestation Planning.

The people's government at all levels should formulate afforestation plans for their area in accordance with the principles of formulating and examining real results. We should implement afforestation plans on every barren parcel of land, planting trees where trees are best, grass where grasses are best, and flowers where flowers are best. Since afforestation is a major affair, the formulation and implementation of afforestation plans should be strict and conscientious. The draft regulations stipulate that the formulation of afforestation plans should be done through discussion and approval by the people's congresses or their standing committees at the same level, and that the situation in implementation of afforestation plans should be reported to the people's congresses or their standing committees at the same level, to guarantee that afforestation plans cannot be casually changed or their implementation stopped because of changes in terms of office or leadership positions. Sichuan's task is to "assure that the forest coverage rate in the province reaches more than 20 percent and that the area planted with grass reaches about 10 percent of the total area suitable for grass by the end of this century." When this task is completed, the province will have more than 170 million mu of forests, and about 20 million mu will be planted with grass manually. According to the stipulations of the General Principles, achieving afforestation in Sichuan should involve planting trees and grass or flowering trees and grass in every possible location in urban and rural areas to eliminate any exposed areas that can be afforested. This task can be completed if only we are determined and struggle arduously.

When formulating plans for rebuilding old cities or constructing new cities we should place afforestation in an important position and achieve afforestation within a limited period of time according to the needs of the state. Afforestation tasks in urban areas, factories and mines are proposed on the basis of state decisions and in combination with the actual conditions in our province. Because the urban afforested area in Sichuan is very small, in order to attain the requirements specified in the draft regulations, we should encourage integration of trees, shrubs, vines, flowers and grass, and integration of afforesting ground surfaces, balconies, hedges, awning frames and roofs to achieve three-dimensional afforestation. Cities should assist in suburban afforestation and the suburbs should observe comprehensive plans for afforestation and construction.

### 3. On the Question of Rights and Responsibilities.

We must depend on "contracting" to control wastelands, implement various forms of contractual responsibility systems, and solve the problem of integrating laborers and economic results to effectively and widely motivate the initiative of the masses to accelerate progress in afforestation. Good results have been achieved in the province-wide development and implementation of ownership systems and responsibility systems (i.e., the "two systems") in mountain forests and grasslands since 1980. However, the "two systems" have not been implemented in almost half of the total townships, communes and brigades in Sichuan. Although some areas say they have been implemented, they have not actually issued any private hillside certificates (including forest rights certificates), have not signed responsibility contracts or the utilization certificates and the contracts that have been signed are incomplete, and cannot motivate the initiative of the masses to control mountains and create wealth. In consideration of this fact, we should make the corresponding stipulations in the draft regulations in order to favor promotion of implementation of the "two systems" and motivate the enthusiasm of the masses for afforestation. Each parcel of non-cultivated land that is suited to forests and grass, as well as existing forests and grasslands, must have clear rights and responsibilities to eliminate the phenomenon of no one being responsible.

### 4. On the Question of Removing Land from Cultivation.

Cultivated land on steep slopes or with serious soil erosion should be gradually removed from cultivation and planted with trees and grass. This is an important measure for preventing serious soil erosion and improving the agricultural ecology. In the past 3 years, the provincial people's government has reduced grain requisition tasks for mountainous areas several times, provided grain supplements for developing mountainous areas many times, and promoted the development of mountainous regions and the removal of land from cultivation for planting trees. Progress in work in this area has been slow, however. Practice over many years has proven that violating natural laws and planting grain on ever-steep slopes makes it increasingly harder to overcome poverty. We must be determined to take land out of cultivation for planting grass and trees, or practice rotation of grains and grass and inter-planting of grain, and develop the diversified economy. This not only can maintain water and soil resources, but also can achieve economic results that

are many times greater than planting grain. In combination with concentration on capital construction, we can open up a new situation for creating wealth. Apart from reaffirming that "new reclamation of land on slopes greater than 25° is prohibited," the regulations make a distinction according to whether the land was reclaimed before or after implementation of the system of contractual responsibility for output quotas in dealing with the question of taking land out of cultivation.

#### 5. Concerning the Question of Afforestation Funds.

Funds for afforestation should mainly come from self-reliance. We should encourage the peasants to invest capital and labor to open up barren mountain sides and beaches. Assist plains areas, areas with rolling hills and mountainous areas, as well as cities and villages, to make joint investments for administration of forestry and animal husbandry. Encourage the peasants households and units that are managing forests and grasslands to develop economic diversification and comprehensive utilization, take the road of integrating long-term and short-term concerns and using the short run to care for the long run, and enliven the economy. Coal, papermaking, communications and other departments and enterprises should work hard in afforestation and appropriate the stipulated afforestation funds, with special funds for special uses and supervision by financial departments and banks. Apart from relying primarily on the masses and all lines of endeavor to engage in afforestation, the state also should provide the necessary assistance for afforestation. State assistance for planting trees and grass should change from simply providing relief to the primacy of compensated assistance and issuance of production loans for development. The draft regulations have made a decision of principle in light of this spirit.

#### 6. On the Question of Rewards and Punishments.

There should be coordination of propaganda and education concerning afforestation. Great efforts should be made to commend and reward regions, units and individuals with superior successes, so that loving and protecting trees, flowers and grass becomes an excellent social custom of urban and rural people. Those regions, units and individuals who have not completed afforestation tasks for improper reasons and any activities that damage afforestation should be dealt with strictly. Based on the opinions of all areas, we not only stipulated in Article 12 that "felling trees in areas off-limits to cutting is prohibited," but also stipulated in Article 27 that administrative handling or legal sanctions will be used for "those who cut in excess of plans, cut in violation of cutting regulations or who do not replant cut-over land in the specified time period." We not only must punish units who cut in violation of regulations, but should also give suitable punishments to those who are responsible for failure to adhere to the related laws of the state and these regulations, as well as for the related administrative leadership personnel who do not make sufficient efforts to prevent pilfering and denudation. Since 1981, the Central Committee has pointed out several times that we should "strictly implement a 'single ledger' for cutting, and prevent overcutting;" "forest regions that overcut should resolutely readjust timber output downward;"

"there can be no quota increases at every level or cutting in excess of plans." The people's government and forestry departments at all levels should resolutely operate according to the instructions of the Central Committee.

After discussion and approval of the "Provisional Regulations on Afforestation in Sichuan Province (Draft)," there should be widespread and intensive propaganda activities to bring up a high tide of planting trees and grass. All levels of the people's government should be responsible for truly strengthening leadership of afforestation work, implementing work responsibility systems and adopting effective measures to conscientiously implement these regulations. People of all nationalities in our province and all lines of endeavor should work together and struggle to create a new situation in afforestation work in Sichuan!

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CSO: 4008/390

## ENVIRONMENTAL QUALITY

### SICHUAN STEPS UP AFFORESTATION WORK

Chengdu SICHUAN RIBAO in Chinese 3 Jul 84 p 2

[Commentary: "Be Bold in Reform, Accelerate Afforestation in Sichuan"]

[Text] The announcement of the "Provisional Regulations on Afforestation in Sichuan Province" is a major event in the development of a mass afforestation movement in our province. The spirit of reform permeates these regulations, and legal forms are used to consolidate the stable fundamental policies and primary experiences in our province's successful implementation of national laws and policies concerning afforestation. This is of major importance for motivating the initiative of people of all minorities in Sichuan and all lines of endeavor to accelerate afforestation in the province.

Practice over the past several years has proven that the planned achievement of socialist modernization not only requires actively grasping and applying objective economic laws, but also requires actively grasping and applying objective ecological laws. In order to meet the ever-increasing material and cultural needs of the people and society during socialist modernization and construction, relative equilibrium among all factors within an ecosystem and in the material exchange between economic construction and the ecosystem must be maintained in a scientific and planned manner. Equilibrium also must be maintained to create an excellent ecological environment for modernization and construction, for carrying out material production that extracts increasingly greater amounts while having permanent utilization of reproducible resources. This is especially true of land and various types of biological resources. After we realize the essentialness of doing this, we still must solve the serious problem of continual degradation of the ecological environment that is due to various historical reasons. This forces us to take on the extremely urgent and difficult task of transforming vicious cycles in the ecosystem into excellent cycles over a relatively long period. "The basic means for transforming vicious cycles in the ecosystem into excellent cycles lies in making great efforts to plant trees and grass for increasing the green vegetation that covers our nation's soil." This is the first item of work for curing the scars that nature has punished us with, for controlling the land well, and for achieving excellent cycles in the natural ecology, and it is a magnificent cause for building socialist material civilization and spiritual civilization, and for creating wealth for later generations according to objective laws.

Cadres at all levels and peoples of all nationalities throughout the province should struggle conscientiously and unceasingly to complete this magnificent cause of transforming the appearance of the countryside.

In order to promote the cause of afforestation, we must further eliminate the influences of "leftist" ideologies, encourage a spirit of reform where we dare to open up and create, and press forward in the face of difficulties. We should use the concepts of ecological economics to overcome all types of working methods that involve building or engaging in exploitative production without concern for local natural and environmental conditions, to evaluate economic results from the angle of ecological equilibrium, and to raise consciousness and initiative to accelerate afforestation and pay attention to environmental protection. We must apply the concept of agriculture in the comprehensive sense to make continual reforms in the structure of agriculture and transform the traditional agricultural system of concentrating mainly on grain production into one that concentrates on intensive administration of the 100 million mu of cultivated land in Sichuan, and we should also concentrate on developmental administration of the 500 million mu of non-cultivated land. Based on the natural and geographic conditions of each place, we must practice agriculture where most appropriate, plant forests where forests are most appropriate, and plant grass where grass is most appropriate; raise the status of forestry and animal husbandry in agricultural production and launch an effort to expand and broaden agriculture. We must resolutely reform the destructive forestry practices of stressing cutting while neglecting afforestation, excessive cutting, and not replacing after cutting, and make the maintenance of ecological equilibrium the first item in forestry production. We must pay attention to and give play to the ecological and economic functions of grassy vegetation, make major reforms in the livestock raising industry, move from "relying on heaven to raise livestock" to the primacy of rational development and utilization of natural grass resources. There should be a focus on gradual extension of artificially-planted grasses, to allow grass planting for livestock raising to become a new line of production for enriching the economy. Rebuilding and construction in urban areas must proceed in coordination with afforestation and beautification of the environment. All of these reforms must be closely integrated with further implementation and perfection of various forms of contractual responsibility systems for afforestation before it will be possible to truly motivate the initiative of the urban and rural masses and all lines of activity to work for afforestation. In summary, "all measures that benefit the ecological equilibrium should be tried out, and all experiences that benefit the acceleration of afforestation should be popularized."

The party leads the people in formulating laws and regulations, and the party should organize and motivate the people to respect and adhere to these laws and regulations. Party, government and military organizations at all levels should utilize all the tools and methods of propaganda to broadly develop study and propaganda movements concerning the "Provisional Regulations on Afforestation in Sichuan Province" and related policies, raise the knowledge of cadres and the masses concerning the significance and urgency of accelerating the pace of afforestation, and resolutely control wastelands and engage in afforestation according to the law. We should integrate these

study and propaganda movements, earnestly examine jurisdiction over afforested land and the situation in implementation of responsibility systems. Cases of non-implementation or poor implementation and cases where the system is incomplete should be urgently implemented and perfected prior to fall afforestation. All urban and rural areas should investigate the situation in preparation for fall afforestation, such as making good deployments for work, strengthening nursery management, preparing sufficient supplies of improved variety seedlings, doing good technical training, and so on, in order to resolutely implement the "Provisional Regulations on Afforestation in Sichuan Province" and solidly develop the fall afforestation movement. Use this as a new beginning, strive for effectiveness, and accelerate the creation of a new situation in afforestation in Sichuan.

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## ENVIRONMENTAL QUALITY

### LIAONING STRIVES FOR CLEAN ENVIRONMENT

Shenyang LIAONING RIBAO in Chinese 5 Jul 84 p 1

[Commentary: "Purify the Environment, Create Wealth for the People"]

[Text] The natural environment is a basic condition on which mankind depends for existence. The growth of man's ability to exploit natural resources has led to continual development of industry and expansion in the scale of production. If we deal inappropriately with industrial waste water, waste gas and residues, it will be extremely easy to pollute the natural environment and destroy the ecological equilibrium, creating serious consequences. For this reason, the CPC Central Committee looks upon environmental protection with the same concern as it has for family planning. It is a fundamental national policy in China, and all areas are required to resolutely concentrate on environmental protection work. This is an important matter that concerns the entire national situation, and a great hundred year plan that concerns our descendants.

Liaoning is a heavy industrial base area with more than 17,000 industrial enterprises at the present time. It has a full complement of metallurgical, coal, chemical, machinery, papermaking and other types of industries. Although this benefits development of the national economy, it also carries with it the problem of fairly severe environmental pollution. If we do not substantially raise the people's understanding of environmental protection and adopt strong and effective measures, environmental pollution will become a major problem that will be hard to solve in a few years. When that time comes, there will be no way for us to justify ourselves to the more than 30 million people of Liaoning, and no way to account for this to our descendants. Even less will it be possible to complete the arduous tasks that the party and the state have given Liaoning for the four modernizations.

At present, there still are a substantial number of comrades, especially leading comrades, who do not clearly understand and have insufficient knowledge of environmental protection. Leading cadres in some industrial and mining enterprises still consider production tasks to be "hard targets", while environmental protections are "soft targets". Someone will ask for reasons if production tasks are not completed, but no one will pursue it if environmental protection work is not completed. It can be seen that correctly dealing with the relationship between economic construction and

protecting the environment and the relationship between production tasks and environmental protection work are the key links in preventing pollution and protecting the environment. The greater the expansion in the scale of industrial production, the greater the corresponding increase in sources of pollution and pollutants. Environmental quality will be degraded further if this work is done poorly. We must overcome superficiality so that environmental pollution and ecological destruction are resolved during the process of economic construction, so that there is synchronous development of economic construction and environmental protection, and so that protection of the environment creates an excellent working and living environment, and guarantees and promotes the development of economic construction. This requires concurrent planning, implementation and development of economic construction, urban and rural construction, and environmental construction. It is also necessary to achieve unity among economic, social and environmental results. Liaoning has clearly put forth comprehensive short-term and long-term tasks of struggle for controlling pollution and protecting the environment. Atmospheric pollution certainly must be controlled in cities and in areas with industrial concentrations and high population densities. Shenyang, Dalian, Anshan, Fushun, Benxi, Fuxin and other cities with severe smoke and particulate pollution should formulate feasible measures and strive to make obvious improvements within 3 to 5 years. If we conscientiously adopt effective measures, solidly integrate technical transformation of enterprises and carry out pollution controls at the same time, the goal of our struggle will certainly be attainable.

An important principle for protecting the environment in China is that "whoever pollutes must control it" and "whoever develops something must protect it." In order to uphold this principle, purify the environment, and create wealth for the people, the state has promulgated the "Environmental Protection Law", the "Marine Environmental Protection Law", the "Water Pollution Prevention Law" and other laws. Environmental protection, economic and judicial departments should join together and concentrate on implementing the "Environmental Protection Law." Regardless of which person, department or unit is involved, anyone who violates environmental protection laws should strictly manage their affairs according to environmental protection laws. The seriousness of laws will be lost if they are not relied upon or strictly implemented. If leading cadres at all levels set an example and motivate the masses so that everyone becomes concerned with environmental protection, supervises environmental protection and upholds the implementation of environmental protection laws, a new situation will certainly appear in environmental protection work in Liaoning.

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## ENVIRONMENTAL QUALITY

### ENVIRONMENT IMPROVES IN LIAONING PROVINCE

Shenyang LIAONING RIBAO in Chinese 5 Jul 84 p 1

[Article: "Pollution is Decreasing, There is an Initial Improvement in the Environment--Liaoning's Capacity for Treating the 'Three Wastes' is Strengthened"]

[Text] All areas of Liaoning have actively improved their capacity to deal with the "three wastes" and speeded up the control of waste gas, waste water and industrial residues. Since last year, the amount of hazardous materials in sewage has been reduced by more than 10,000 tons, sulfur dioxide in the atmosphere has been reduced by more than 130,000 tons, particulate precipitation has been reduced by 560,000 tons, and there has been an initial improvement in the environment. All areas of the province and all industrial and mining enterprises are resolutely adhering to the principle of "whoever pollutes must control it", and many enterprises have strengthened their sense of responsibility and urgency in controlling pollution. They have actively brought together the capital and arranged control projects.

More than 1,000 projects for controlling the "three wastes" were arranged in Liaoning last year, with total investments of more than 160 million yuan. More than 800 environmental protection projects were completed and put into operation during 1983, and the daily waste water treatment capacity grew by 270,000 tons. The oil, phenol and chlorine content of waste water was reduced by more than 10,000 tons. The hourly industrial waste gas treatment capacity increased by 4 million standard cubic meters, and waste gas discharges have dropped by 12 billion cubic meters each year. This reduction in pollution and recovery of resources has greatly increased the wealth of the nation.

Environmental protection departments in Fushun City have used pollution discharge fees to assist enterprises in controlling pollution, and they have signed 50 "economic contracts" with enterprises. According to the requirements of the contracts, 23 of them should be completed within the year, and 22 have already been completed, with excellent results. The Longfeng Mine, in order to achieve an "economic contract", assigned a deputy engineer to specialize in environmental protection projects, and completed a sewage treatment project one month ahead of schedule. It treats 7.3 million tons of sewage each year, and can recover 50,000 tons of coal slurry, creating a value

of 240,000 yuan. This ended a history of more than 50 years of pollution of the Hui He by mine water. Environmental protection departments in Benxi City signed 26 "responsibility certificates" with related departments last year and implemented a contractual responsibility system that contracts responsibility for investments, construction periods, quality, uses and results. Sixteen pollution engineering projects were given awards for completion, and fines were imposed on those responsible for the slow rate of progress in projects at the Bengang Power Plant and the Benxi Cement Plant. This effectively promoted control of environmental pollution in the enterprises.

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## ENVIRONMENTAL QUALITY

### DATA OBTAINED ON BACKGROUND LEVEL OF RADIATION

Beijing JIANKANG BAO in Chinese 31 Jul 84 p 1

[Article: "Data on External Exposure to Environmental Background Radiation is Obtained for the First Time in China--Data Provided for Formulating Public Health Standards and Environmental Protections"]

[Text] There has been rapid progress and obvious success since survey and research work on environmental radiation levels and human exposure doses was undertaken on a national scale 2 years ago. A survey of external exposure doses from environmental background radiation has been basically completed, and data on exposure to environmental background radiation for the entire country has been obtained for the first time. Grouped comparisons have been made in a special investigation on accumulated doses for internal and external exposure, and many provinces, municipalities and autonomous regions are now carrying this out.

On the basis of unified planning, unified methods and unified quality controls, each province, autonomous region and directly administered municipality formulated and independently carried out a program based on the special characteristics of the region during the survey. Hebei, Shaanxi, Liaoning and other provinces centralized their forces and time, and the survey work progressed very quickly. Minjiang surveyed 7,769 points scattered throughout the region and obtained more than 200,000 pieces of data. Survey points were set up in special regions like the Tibetan Plateau, frontier posts, the Turfan Basin, natural pools, Jingpo Hu, river water surfaces, scenic and tourist areas, special economic zones, coastal islands, the sea surface, and areas around nuclear power plant sites. This survey filled a void in China, and its data serves resource development, national economic construction and the application of nuclear technology throughout the country. Moreover, it can provide a reliable foundation for research on radiation medicine and for the formulation of public health standards and environmental protections.

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## ENVIRONMENTAL QUALITY

### IMPACT OF ACID RAIN ON AGRICULTURE

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION]  
in Chinese No 4, Aug 84 pp 15-18

[Article by Zhang Yaomin [1728 5069 3046]: "The Influence of Acid Rain on Agriculture"]

[Excerpts] At present, the potential impact of acid rain on man's environment is being given attention throughout the world. Some nations that have suffered deeply from it are treating acid rain as an urgent problem and are searching for an effective response to it.

According to related information, acid rain has begun to appear in some provinces and regions in southern China. In parts of some regions, it is threatening the environment to some degree. For this reason, the potential impact of acid rain on agriculture and the agricultural environment is a question that awaits in-depth research and that cannot be ignored.

#### I. Acid Rain's Impact on Agriculture in China

Research concerning the impact of acid rain on agriculture has not yet been developed in China. Recently, some regions reported on a field survey of the danger from acid rain toward farm crops. The Chongqing City Environmental Protection S&T Monitoring Institute and other units reported that from May to July 1982, there were four instances of obvious damage caused to crops by acid rain in the Chongqing area. The pH of the acid rain varied from 3.6 to 4.6, and the area of farmland that was damaged totalled several tens of thousands of mu. The main crop that suffered damage was paddy rice; legumes, tubers and other crops also were damaged. All types of crops exhibited obvious symptoms of damage to their leaves. The most serious instance of damage was on the night of 16 June 1982, when the pH of the precipitation was 3.9 to 4.2. The next morning, the leaves of paddy rice in the Changsheng area of Baxian County turned pale, and then a crimson color in the afternoon. Within a few days, the stalks in some areas had withered and died. The amount of farmland suffering damage probably exceeded 10,000 mu. It is estimated that output dropped by more than 6.5 percent. A joint investigation by the Chongqing City Agricultural Sciences Institute and other units showed that the damage did not arise from disease or pests, nor from physiological diseases. According to the report, crops in the field have been damaged by acid rain in some areas of

Jiangsu in recent years. The primary crops suffering damage were paddy rice, cotton, sweet potatoes, vegetables, watermelons, berry trees, and others. According to my understanding, this type of phenomenon has been observed in other provinces and regions.

It should be pointed out that there are very few reports of direct damage to crops in the field from acid rain in other countries. It has never appeared in some countries that suffer from severe acid rain pollution. Although the acidity of atmospheric precipitation in some regions of China is nearing that of acid rain regions of Europe and America, it has never reached or exceeded the range of acidity found there. According to data from foreign sources, it is impossible for atmospheric precipitation with current acidity levels to cause obvious direct damage to crops in the field. Scholars at home and abroad have different views of the information reported by several departments in China. Based on our most recent investigation and data analysis, we feel that data contained in the reports lack full scientific reliability, and that some of the reports are pure conjecture or reporting errors. Someone's report that the watermelons in a certain commune in Suzhou [Jiangsu Province] were damaged by acid rain with a pH of 4.7 and that all the young vines had rotted and died is an example. There should be full analysis of the data reported on direct damage to crops in the field caused by acid rain in China in order to derive the correct conclusions. As everyone knows, the areas where acid rain has appeared are those with severe atmospheric pollution. For this reason, we must be sure that we do not mistake the damage caused by atmospheric pollution for damage from acid rain. The damage to fields reported in all areas could be due to a fall in atmospheric pressure after a rain, to an increase in the relative humidity in the atmosphere, or to the unfavorable dispersion of atmospheric pollutants. These cause acute damage to crops in the field or can cause direct damage to them by forming an acid cloud. Generally speaking, the acidity of acid clouds is even higher than the acidity of acid rain. It also is possible that, after an acid rain, the crop's sensitivity to certain atmospheric pollutants may increase, or it may result from the combined role of acid rain and certain atmospheric pollutants (such as sulfur dioxide). In summary, when reporting damage to crops in the field from acid rain, there should be thorough investigation, comprehensive analysis and cautious conclusions. We have not seen reports concerning the influence of acid rain on agricultural soils. According to an analysis of related data, soil types in the areas polluted by acid rain in China are extremely sensitive or moderately sensitive to a drop in acidity. This is a question that deserves attention. Annual precipitation in the acid rain regions south of the Chang Jiang in China is fairly high, and the amount of acid that is transported in is also fairly high. In the long run, acid rain will inevitably result in a certain degree of acidification of these sensitive soil types. The heavy metallic ions (such as aluminum ions) leached from the soil could potentially damage surrounding bodies of water.

In China, we should pay attention to and strengthen research on the effects of acid rain on the agricultural ecosystem. Related departments should organize their forces to determine the scope, degree and forms of the effects of acid rain on the agricultural ecosystem. On the basis of qualitative research, we

should gradually move to quantitative research in order to provide reliable scientific data and search for effective responses. In the development of research work in this area, we should pay attention to the widespread development of field experiments and obtain results under standard agricultural measures and natural conditions so as to accurately reflect the influence of acid rain on the agricultural ecosystem.

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## ENVIRONMENTAL QUALITY

### HEILONGJIANG ACHIEVES SUCCESS IN AFFORESTATION

Beijing RENMIN RIBAO in Chinese 9 Aug 84 p 2

[Article: "Heilongjiang Province Achieves New Successes in Forestry Production--Reform Systems, Transfer Authority to Lower Levels, Integrate Administration"]

[Text] The Heilongjiang Province Forestry Department has earnestly corrected the guiding ideology in professional work through party consolidation, and it has resolved to make reforms and open up a new situation in forestry work. The province has afforested 6.21 million mu this year, greatly exceeding the annual afforestation plan task of 5.5 million mu. Three prefectures in the province have afforested more than 1 million mu, and have become the "three northern forests" of China. The 28 counties in the shelter forest construction system have built 1.37 million mu of agricultural shelter forests and completed the projects stipulated by the state 1 year in advance. There has been an obvious increase in all types of forestry administration projects, and the results are continually improving. Commodity production of medicinal materials, Auricularia auricula-judae, construction materials and so on has grown by 70 percent over the same period last year. Forest protection and fire prevention work is also the best since the founding of the country.

The achievement of these successes was made possible mainly through reforms in three areas:

1. Reform of forestry management systems, adjustment of the relationship between regulations and forests.

The Forestry Department and Heilongjiang provincial administrative offices implemented a policy of "transfer downward and contractual responsibility" on a trial basis. "Transfer downward" refers to the transfer of control over certain state-run forests, nurseries, truck teams, lumber processing mills and other enterprises and units originally under unified administration by the provincial department down to prefectoral forestry bureaus for unified administration. The prefectures next transferred the forests and nurseries down to cities and counties. "Contractual responsibility" refers to the implementation of contractual financial responsibility: "determine base amounts for income and expenses, no supplements for overspending or income shortages, excess income split proportionally, no change for 5 years."

2. Internal contracting, external integration, comprehensive administration.

"Internal contracting" refers to breaking up the "iron rice bowl" so that production and management of nurseries, afforestation, forest administration, the diversified economy and comprehensive utilization of timber are contracted out to employees and their families to set up family-run forests and to establish contractual responsibility for development, protection and utilization.

"External integration" refers to contractual responsibility for excess woods, the "two wastelands" suitable for forests and other natural resources within state-run forests to integrate administration of each line of activity with the masses, or to bring in local peasants to participate in various types of forestry production activities.

3. Encourage millions of households to engage in forestry.

The amount of "two wastelands" in the hands of the masses increased from 1.89 million mu last year to 5.3 million mu. In addition, the forests have been photographed, so that the land is in the household and the photographs are in their hands. The number of the "three households" engaged in afforestation increased from 230,000 households last year to 500,000 households at present.

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## ENVIRONMENTAL QUALITY

### HUNAN'S WASTE RECYCLING HELPS 'MAKE A FORTUNE'

OW280831 Beijing XINHUA in English 0657 GMT 28 Oct 84

[("Where There's Muck--There's Yuan"--XINHUA headline]

[Text] Changsha, 28 October, (XINHUA)--A big drive in central China's Hunan Province to collect and recycle waste has led to the recovery of 10 million yuan worth of reusable materials in 1 month.

It has also unearthed "treasure" in the form of 641 kilograms of ancient copper coins, according to officials of the provincial waste materials recovering corporation, whose motto is: "Waste collection can help make a fortune."

The campaign was started as part of the big national day clean-up, said officials, and by the end of September it had netted 95,000 tons of metal scraps and 22,000 tons of rags and other paper-making materials.

Waste is brought to the corporation's 7,300 yards and warehouses by its 30,000 workers, who tour streets, villages, factories and shops.

It is then sorted ready for recycling. The Changsha brewery, for instance, depends on recycled bottles for a quarter of its needs.

The ancient copper coins were sent to the provincial museum by one yard that has recovered 1,263 antique bronze items from discarded rubbish over the past 30 years.

Provincial authorities have been encouraging the setting up of more waste recovery businesses by offering tax reductions.

Deng Yuanqiu, a peasant in Liling County, made 10,000 yuan last year by collecting 80 tons of waste materials from villagers, and then selling this to the corporation. There are believed to be about 13,000 small businesses like his doing this work.

Corporation manager He Yushan said: "Although the trade used to be regarded as a humble one, I am confident that our corporation has a bright future."

"We are exploiting renewable resources for society and turning waste into treasure. Now, more and more young people are willing to take a job in this line."

It has been estimated that every year the province has a potential source of 800,000 tons of waste materials, including metals, glass, rubber, plastics, rags and paper, and the figure is likely to rise, along with consumption. At present the recovery rate is less than half this amount.

CSO: 4010/19

## ENVIRONMENTAL QUALITY

### BRIEFS

COMPANY TO PROTECT SEA--Shanghai, 1 November, (XINHUA)--Shanghai has set up a company aimed at better environmental protection of the East China Sea where Chinese and foreign companies are working together to develop the area's oil resources. The city is the land base for the Chinese-foreign joint petroleum endeavor on the sea, which it faces. The East China Sea Marine Environmental Service Company set up yesterday will conduct environmental surveys and help in the treatment of sea water pollution by oil, according to a company spokesman. The company will provide services including marine hydrological and meteorological forecasts. [Text] [Beijing XINHUA in English 1452 GMT 1 Nov 84 OW]

WASTE WATER TREATMENT PLANT--Hohhot, 3 November, (XINHUA)--The first phase construction of a large waste water treatment plant has been completed in the Huolinhe coal mining area in east Inner Mongolia. Built in conjunction with the Huolinhe open-cast coal mine, the project is designed to prevent pollution of nearby grassland and the Huolin River, where 20,000 Mongolians raise one million head of livestocks. The waste water of the mining area will be led out of the area through a 16-kilometer underground pipeline to a purifying plant and then to a water storage tank another four kilometers away before being used for irrigation. When the whole project is completed, it can treat 10,000 cubic meters of waste water every day and the treated water may irrigate 1,300 hectares of grassland, mining officials said. Huolinhe will be one of China's largest opencast coalfields. The production capacity of the mines is designed to be 50 million tons by the year 2000. Nanlutian, one of the mines in the area, began production on 1 September. It produces three million tons of lignite a year. [Text] [Beijing XINHUA in English 1032 GMT 3 Nov 84 OW]

LIAONING AFFORESTATION--Over the past 35 years, Liaoning Province has afforested some 39 million mu, a 27-fold increase over the early period of liberation. The percentage of forest-covered land rose from 12.9 to 25.1. Thus far, this province has 130,000 specialized forestry households. This spring alone, Liaoning province fulfilled 97.3 percent of the annual afforestation task. [Summary] [Shenyang LIAONING RIBAO 1. Chinese 19 Sep 84 p 1 SK]

NORTH CHINA SHELTER-FOREST--Yinchuan, 28 Oct, (XINHUA)--This reporter learned from the department concerned that the Northeast, North, and Northwest-China shelter-forest project afforested 4.83 million mu of land during this year's rainy season. The area afforested in spring and summer reached 21.93 million mu, overfulfilling annual plan by 36 percent. Assuming a 55 percent survival rate, and adding the 66 million mu of forest completed before 1984, 86 percent of the first-phase project of the Northeast, North, and Northwest-China shelter-forest project, which is scheduled to be completed in 1985, has been completed as of this date. [Text] [Beijing XINHUA Domestic Service in Chinese 0023 GMT 28 Oct 84 OW]

## PUBLICATIONS

### BRIEFS

SCIENCE NEWS--Beijing, 14 Oct (XINHUA)--KEXUE BAO [SCIENCE NEWS], a weekly aimed at promoting science, will be issued starting from January next year. The paper, run by the Chinese Academy of Sciences, will explain policies on scientific studies and research, spread scientific and technological information and recommend valuable scientific research results achieved at home and abroad. It will also publish views, opinions and proposals of scientists. The weekly is to be published on Sundays. [Text] [Beijing XINHUA in English 0309 GMT 14 Oct 84 OW]

CSO: 4010/14

Chemistry

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TITLE: "Change in Microstructure During the Crystallization Process  
of Lepidolite Based Glass Ceramics"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY]  
in Chinese No 4, Dec 83 pp 430-434

TEXT OF ENGLISH ABSTRACT: The change in microstructure during the crystallization process of lepidolite based glass ceramics is described according to the morphological relation shown in electron microphotographs. Specimens, including mother glass and some treated at different temperatures during the same period, were studied. It has been shown that phase separation already appears before crystallization. Tainiolite precipitates first at the lower temperature range; as the treating temperature increases to 800°C,  $\beta$ -spodumene forms rapidly; then it transforms into lepidolite solid solution incongruently. Reactions occurring in the phase boundary regions can be examined and explained theoretically by a series of electron microphotographs. The microstructure formed in lepidolite and  $\beta$ -spodumene as well as the matrix will determine the machinability and other properties of the glass ceramics.

Chemistry

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TITLE: "A Study of the Factors Affecting the Sinterability of Shandong Magnesite Concentrate Prepared by Flotation"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese No 4, Dec 83 p 443-450

TEXT OF ENGLISH ABSTRACT: A synthetic magnesia-dolomite refractory of high purity and high compactness has been made by mixing a magnesite flotation concentrate available in Ye County, Shandong Province, with highly purified lime. Subsequently, the mixture is calcinated and treated under proper conditions. The study shows that in addition to optimal calcinating temperature, purity of raw materials and technological conditions, the physical properties of the raw materials appear to be an important factor affecting sinterability.

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TITLE: "A Study of Synthesis of  $\alpha$ -Si<sub>3</sub>N<sub>4</sub> Powder by Use of Silica"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese No 4, Dec 83 pp 469-476

TEXT OF ENGLISH ABSTRACT: A method of synthesizing silicon nitride powder by reaction within silica, carbon and nitrogen is briefly described, and the influence of proportion of raw materials, reaction temperature, time and atmosphere on nitriding are investigated. In the system of SiO<sub>2</sub>-C-N<sub>2</sub>, additives have been studied, and an effective additive has been found; therefore, a fine equiaxial Si<sub>3</sub>N<sub>4</sub> powder with an average particle size of about 0.5  $\mu$ m and more than 95 percent of  $\alpha$ -Si<sub>3</sub>N<sub>4</sub> is obtained.

Chemistry

AUTHOR: SHENG Ximin [4141 4872 2404]  
LU Peiwen [7120 0160 2429]  
XU Jie [1776 3381]

ORG: Nanjing Institute of Chemical Technology

TITLE: "A Study of Pressureless Sintering of  $\text{Si}_3\text{N}_4$  with  $\text{Al}_2\text{O}_3\text{-Y}_2\text{O}_3$  as Sintering Aid"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese No 4, Dec 83 pp 477-488

TEXT OF ENGLISH ABSTRACT: Pressureless sintering of  $\text{Si}_3\text{N}_4$  with  $\text{Al}_2\text{O}_3$  and  $\text{Y}_2\text{O}_3$  as sintering aids at a temperature of  $1740\sim1780^\circ\text{C}$  has been studied. The results show that  $\text{Si}_3\text{N}_4$  added to less than 6.5 percent of  $\text{Al}_2\text{O}_3\text{-Y}_2\text{O}_3$  can be sintered at  $1760^\circ\text{C}$  for 2~3 hours under 0.5~0.7 pressure gauge of  $\text{N}_2$  to obtain a highly dense nitrogen ceramic, which will have a relative density of 96~99 percent and a bending strength of  $500\sim600 \text{ MN/m}^2$ , with some even exceeding  $700 \text{ MN/m}^2$ .  $\text{Si}_3\text{N}_4$  of high  $\alpha$ -phase content and fine particles used are the causes for high sinterability. The powder bed with composition of  $77\text{Si}_3\text{N}_4+20\text{BN}+3\text{MgO}$  is effective for reducing weight loss and increasing densification. The microstructure of specimens has been studied by use of X-ray diffraction, SEM and electron probe. The results show that  $\text{Al}_2\text{O}_3$  has been dissolved in the lattice of  $\beta\text{-Si}_3\text{N}_4$ , forming  $\beta'\text{-Si}_3\text{N}_4$  solid solution. The lattice parameters increase with the amount of addition of  $\text{Al}_2\text{O}_3$ .

9717  
CSO: 4009/68

Chemistry

AUTHOR: JIA Lianda [6328 6647 6671]  
WANG Guoying [3769 0948 5391]  
YU Wenhui [0060 2429 0565]  
LIU Li [0491 7787]

ORG: Changchun Institute of Applied Chemistry, Chinese Academy of Sciences

TITLE: "A Study on the Tearing Strength of Some Oil-extended Polybutadiene Rubbers Prepared with Lanthanide Catalyst"

SOURCE: Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 6, Dec 83 pp 432-437

TEXT OF ENGLISH ABSTRACT: The morphological structure and crystallization kinetics of some oil-extended polybutadiene rubbers polymerized with lanthanide catalyst were studied with an electron microscope, wide-angle X-ray diffraction, thermal weight-loss analysis and dynamic mechanical measurement. It has been found that No 9 oil has a higher molecular weight than the rest; its compatibility with rubber is much lower; some chemical linkages may exist between oil and rubber when vulcanized; and the No 9 oil-extended rubber shows stress-induced crystallization. All these contribute to the higher tearing strength possessed by the No 9 oil-extended polybutadiene rubber.

9717  
CSO: 4009/71

Chemistry

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LUO Boliang [5012 0130 5328]  
WANG Xiugang [3769 4423 1511]  
WU Renjie [0702 0086 3381]

ORG: Institute of Chemistry, Chinese Academy of Sciences

TITLE: "Studies on PAN Macromolecular Semiconducting Fiber; Preparation of Conducting Fiber from Treated PAN and Its Semiconducting Behavior"

SOURCE: Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 1, Jan 84 pp 1-5

TEXT OF ENGLISH ABSTRACT: The polyacrylonitrile (PAN) fiber treated by Lewis acids (e.g., stannic chloride) can be transformed into a macromolecular conducting fiber by further heat treatment. The resistance of the fiber varies from  $10^3$  to  $10^{12} \Omega \text{ cm}$  with different thermal treatment, and remains stable after hydrolysis. The fiber has enough strength to be processed by various means. This is a new kind of macromolecular conducting fiber having some analogies to organic semiconductors.

AUTHOR: YANG Jihua [2799 4949 5478]  
PANG Shufen [6614 2631 5358]  
OUYANG Jun [2962 7122 0971]

ORG: Changchun Institute of Applied Chemistry, Chinese Academy of Sciences

TITLE: "On Catalytic Activity of Bivalent Rare Earth Chlorides for Butadiene Polymerization"

SOURCE: Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 1, Jan 84 pp 73-76

TEXT OF ENGLISH ABSTRACT: Bivalent rare earth chlorides-- $\text{NdCl}_2 \cdot n\text{THF}$  and  $\text{SmCl}_2$ --have been synthesized through the reduction of corresponding trivalent chlorides with Lithium/Naphthaline in THF. Their catalytic activity for butadiene polymerization is studied here. The system composed of  $\text{NdCl}_2 \cdot n\text{THF}$  and  $\text{Et}_3\text{Al}$  showed a moderate catalytic activity, while that composed of  $\text{SmCl}_2$  and  $\text{Et}_3\text{Al}$  was inactive. The difference in activity between  $\text{NdCl}_2 \cdot n\text{THF}$  and  $\text{SmCl}_2$  is discussed.

9717  
CSO: 4009/70

Chemistry

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ORG: Institute of Chemistry, Chinese Academy of Sciences

TITLE: "Studies on PAN Macromolecular Semiconducting Fiber; Preparation of Conducting Fiber from Treated PAN and Its Semiconducting Behavior"

SOURCE: Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 1, Jan 84 pp 1-5

TEXT OF ENGLISH ABSTRACT: The polyacrylonitrile (PAN) fiber treated by Lewis acids (e.g., stannic chloride) can be transformed into a macromolecular conducting fiber by further heat treatment. The resistance of the fiber varies from  $10^3$  to  $10^{12} \Omega$  cm with different thermal treatment, and remains stable after hydrolysis. The fiber has enough strength to be processed by various means. This is a new kind of macromolecular conducting fiber having some analogies to organic semiconductors.

AUTHOR: YANG Jihua [2799 4949 5478]  
PANG Shufen [6614 2631 5358]  
OUYANG Jun [2962 7122 0971]

ORG: Changchun Institute of Applied Chemistry, Chinese Academy of Sciences

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TEXT OF ENGLISH ABSTRACT: Bivalent rare earth chlorides-- $\text{NdCl}_2 \cdot n\text{THF}$  and  $\text{SmCl}_2$ --have been synthesized through the reduction of corresponding trivalent chlorides with lithium naphthaline in THF. Their catalytic activity for butadiene polymerization is studied here. The system composed of  $\text{NdCl}_2 \cdot n\text{THF}$  and  $\text{Et}_3\text{Al}$  showed a moderate catalytic activity, while that composed of  $\text{SmCl}_2$  and  $\text{Et}_3\text{Al}$  was inactive. The difference in activity between  $\text{NdCl}_2 \cdot n\text{THF}$  and  $\text{SmCl}_2$  is discussed.

9717  
CSO: 4009/70

Chemistry

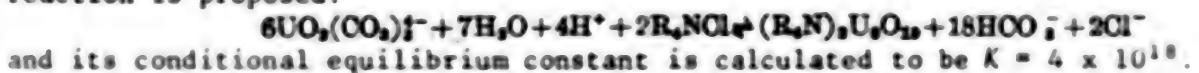
AUTHOR: LIU Suxian [0491 4790 6343]  
YU Xianghao [0060 3276 3185]  
YIN Jinyao [3009 2516 1031]

ORG: Beijing Institute of Uranium Ore Processing

TITLE: "Study on Extraction of the Polynuclear Complex of Uranium by Quaternary Ammonium Salt. I. the Complex  $(R_4N)_2U_6O_{19}$ "

SOURCE: Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese No 1, Jan 84  
pp 97-100

TEXT OF ENGLISH ABSTRACT: The mechanism of uranium extraction by a secondary alcohol-kerosene solution of a quaternary ammonium salt from a nearly neutral ammonium carbonate solution is studied. The composition of the complex extracted is determined by the saturated loading method, the IR spectra, logarithmic analysis, and the continuous variation method. When the composition of the aqueous solution is U(VI) 0.01 M,  $NH_4HCO_3$  0.02 M,  $(NH_4)_2SO_4$  0.05 M and pH = 6.5 ~ 8.5, the composition of the complex extracted is shown to be  $(R_4N)_2U_6O_{19}$ . The following extraction reaction is proposed:



9717

CSO: 4009/78

Chemistry

AUTHOR: HUANG Qiang [7806 1730]  
FANG Peisheng [2455 1014 3932]

ORG: Xi'an Jiaotong University

TITLE: "Development of the Potassium Ion Sensitive Semiconductor Device"

SOURCE: Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese No 2, Feb 84  
pp 189-193

TEXT OF ENGLISH ABSTRACT: The characteristics of the semiconductor device with two crown ethers coated on  $\text{Al}_2\text{O}_3$  gate surface are studied. Using the Ag-AgCl electrode as the reference, one can seal the reference electrode together with the semiconductor device. So it is possible to reduce the size of the device, and it will be easier and more convenient to operate.

Two kinds of devices exhibited a linear response to potassium ion within the concentration range of  $1 \times 10^{-4}$  ~ 1M KCl. Their calibration plots had a slope of 55 mV per activity decade at 25°C. Potentiometric selectivity coefficients of  $\text{K}^+$  to  $\text{Na}^+$  for the two kinds of devices were  $1.5 \times 10^{-2}$  (Crown 1) and  $3.16 \times 10^{-3}$  (Crown 2) respectively.

9717

CSO: 4009/79

## Contraception

AUTHOR: HOU Zhongkang [0186 0112 1660]  
LIU Danguang [0-91 2481 0342]  
CAO Fengxun [7559 1144 3410]  
CHEN Shangli [7115 1424 7787]

ORG: HOU and LIU both of Chongqing Worker's Hospital No 1; CAO of Chongqing Daping Hospital; CHEN of Chongqing Steel Plant No 3 Hospital

TITLE: "Studies on Termination of Early Pregnancy with Bromo-Geraminium"

SOURCE: Shanghai SHENGZHI YU BIYUN [REPRODUCTION AND CONTRACEPTION] in Chinese No 3, Aug 84 pp 12-14

TEXT OF ENGLISH ABSTRACT: The authors introduced 3 ml of 2-3 percent Bromo-Geraminium (BG) solution in the uterine cavities to induce abortion of 356 women during early pregnancy from March 1979 through June 1980. The success rate in the termination of early pregnancy was 80.1 percent, and even 96.5 percent in those who had been pregnant for less than 5 weeks. The mean abortion time was  $40.9 \pm 19.7$  ( $\bar{x} \pm S$ ) hours. It was noticed that the blood HCG level dropped dramatically after the introduction of BG into the uterine cavity. It has been demonstrated experimentally and clinically that this method is effective, safe, simple and inexpensive, and that the normal menstrual cycle recovers quickly without side effects.

Contraception

AUTHOR: ZHANG Min [1728 3787]  
WANG Huaifu [3769 2037 4395]  
YU Junrong [0060 0193 2837]  
LI Rongxiu [2621 2837 4423]  
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ORG: ZHANG, WANG Huaifu, YU and LI all of the Department of Physiology and Biochemistry, Family Planning Institute of Hebei Province, Shijiazhuang; WANG Zhenhai of the Department of Obstetrics and Gynecology, Hebei Medical College Second Hospital

TITLE: "Studies on Induction of Abortion by Preparations of Yuanhua (5357 5364) (Wikstroemia, Chamiaecephae Meissa) in Mid-pregnancy--Direct Action of Huangyuanhua [7806 5357 5364] and Yuanhua Pertene on Human and Rabbit Uterus Muscle in Vitro"

SOURCE: Shanghai SHENGZHI YU BIYUN [REPRODUCTION AND CONTRACEPTION] in Chinese No 3, Aug 84 pp 15-19

TEXT OF ENGLISH ABSTRACT: The results obtained in our experiment may be summarized as follows:

- (1) The present paper undertakes to report the direct action of the Alchorneayuanhua and Yuanhua Pertene on human pregnant uterus strap and of Huangyuanhua suspension on rabbit pregnant and nonpregnant uterus muscle strap.
- (2) The results of the experiments in vitro have clearly proved that Alchorneayuanhua exerted a direct effect on the human pregnant uterus, strengthening its contraction, but Yuanhua Pertene did not have such an effect. It is implied that Huangyuanhua has two compositions: one is Tiannua Pertene which can induce an abortive effect, and the other is a substance that can directly induce contraction of the uterus. This substance exerts a positive action in abortion.
- (3) There is a difference between the response of the rabbit pregnant and nonpregnant uterus muscle to the Huangyuanhua suspension; the former's uterus contraction is made stronger, while the latter's contraction is not affected. The results show that the irritability of the pregnant uterus muscle is distinctly raised due to the effect of the increased amount of hormone.

## Contraception

AUTHOR: ZHUANG Liuqi [8369 3966 3825]  
TANG Bangyuan [2799 6721 0337]

ORG: Both of the International Peace Maternity and Child Health Hospital  
of China Welfare Institute

TITLE: "Comparison of Clinical Effects of Stainless Steel IUD Ring With and  
without Copper"

SOURCE: Shanghai SHENGZHI YU BIYUN [REPRODUCTION AND CONTRACEPTION]  
in Chinese No 3, Aug 84 pp 48-50

TEXT OF ENGLISH ABSTRACT: Reported in this paper is the clinical efficacy of  
using a stainless steel IUD ring with copper (SSRC) in 1154 cases and that of  
using the same IUD form without copper (SSR) in 1298 cases. Both forms were  
used during the same period, from January 1978 to April 1980. The clinical  
effects were evaluated according to the life table. The results of observa-  
tion during the two year period were as follows:

The gross cumulative pregnancy rate of SSRC (2.85/100 women) was significantly  
lower than that of SSR (7.90/100 women) ( $p<0.01$ ). The expulsion rate of SSRC  
was higher than that of SSR--19.28 versus 15.78 per 100 women ( $p<0.05$ ); and  
the medical removal rate was 8.74 and 7.60/100 women respectively ( $p>0.05$ ).  
The continuation rate during the two year period was 67.56 and 67.71/100 women  
respectively ( $p>0.05$ ), with no significant statistical difference between the  
two groups.

Women wearing the SSRC had a lower pregnancy rate and the medical removal rate  
was not increased, therefore it is suggested that the SSRC be used more widely,  
despite its somewhat higher expulsion rate. This we expect to lower with  
improvement in technique.

9717  
LNU 8419/21

Nuclear Physics

AUTHOR: SHEN Guanren [3088 0385 0088]  
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WEN Chenlin [3306 3819 2651]  
YU Chunying [0060 2504 5391]  
et al.

ORG: All of the Institute of Atomic Energy, Chinese Academy of Sciences,  
Beijing

TITLE: "Fast Neutron Elastic Scattering Differential Cross Sections  
from  $^{238}\text{U}$ "

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in  
Chinese Vol 6 No 3, Aug 84 pp 193-200

TEXT OF ENGLISH ABSTRACT: Improvement of an associated particle TOF spectrometer and measurement of 14.2 MeV neutron elastic scattering differential cross sections from  $^{238}\text{U}$  are described. A goniometer and shielding collimator system as neutron detector is constructed, moved by an air cushion. The electronics and detector are replaced by new ones. The flight path is about 3 meters. The neutron detector is biased in 3.5 MeV neutron energy. Resolution time is about 1 ns for 14.2 MeV neutrons. Differential elastic scattering cross sections are measured at 44 angles from 10° to 160° by 2.5 or 5° steps.

Our data is compared with other results and they are in agreement within experimental error. In addition, the experimental results are compared with calculated ones from a spherical optical model and coupled channel theory.

Nuclear Physics

AUTHOR: CHENG Yehao [4453 2814 3185]  
LU Xiuqin [6424 4423 3830]  
YANG Zhuqing [2799 4554 3237]  
et al.

ORG: All of the Institute of Atomic Energy, Chinese Academy of Sciences,  
Beijing

TITLE: "The Odd-Even, Symmetry and Shell Effects in Pre-equilibrium  
Emission"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese  
Vol 6 No 3, Aug 84 pp 210-218

TEXT OF ENGLISH ABSTRACT: The energy spectra and angular distributions of protons for  $^{55}\text{Mn}$ ,  $^{58}\text{Ni}$  ( $\alpha$ , p) reactions at  $E_\alpha = 27$  MeV are measured. The exciton model theory can reproduce the experimental results quite well. The probabilities of pre-equilibrium emission of ( $\alpha$ , p) and ( $\alpha$ , n) reactions for a series of nuclei are analyzed systematically. It is found that under the lower excitation energy, the odd-even, symmetry and shell effects should exist in the probability of pre-equilibrium emission. As the incident energy increases, these odd-even, symmetry and shell effects of pre-equilibrium emission should become weaker. The reason for these phenomena is the characteristic of related binding energies and pairing correction energies. The parameter K in the average transition matrix element has to be changed a little with the incident energy and is discussed.

Nuclear Physics

AUTHOR: SHEN Qingbiao [3947 1987 1753]  
TIAN Ye [3944 6851]  
WANG Shunuan [3769 2579 2541]  
ZHAO Fujian [6392 4395 1696]  
et al.

ORG: SHEN, TIAN, WANG, et al., all of the Institute of Atomic Energy,  
Chinese Academy of Sciences, Beijing; ZHAO of Guizhou University, Guiyang

TITLE: "Exciton Transition Rate Calculations Based on Optical Model  
Potentials"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese  
Vol 6 No 3, Aug 84 pp 245-249

TEXT OF ENGLISH ABSTRACT: Exciton transition rates are calculated using the imaginary part of both the phenomenological optical potential and the microscopic optical potential with Skyrme interaction. Basically the calculated results for the heavier nuclei support the conclusion obtained in the exciton model, i.e., the transition rate  $\lambda_+$  is proportional to the excited energy  $E^*$  and independent of the mass number  $A^*$  of the compound nucleus. If the chosen constant  $K \approx 400\text{MeV}^3$  in the exciton model, the calculated transition rates  $\lambda_+$  are in fairly good agreement with the calculated  $\lambda_{\text{opt}}$  based on the optical model potentials. For the light nuclei the calculated  $\lambda_{\text{opt}}$  has the characteristic features, i.e., the transition rate increases as the mass number decreases when the excited energy is low, and the transition rate decreases as the mass number decreases when the excited energy is high.

Nuclear Physics

AUTHOR: LI Cha [2621 5420]  
SU Zongdi [5685 1350 3321]

ORG: Both of the Institute of Atomic Energy, Chinese Academy of Sciences,  
Beijing

TITLE: "Calculation of the Double Differential Cross Sections for Particle Emissions in the Continuum Region"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese  
Vol 6 No 3, Aug 84 pp 264-271

TEXT OF ENGLISH ABSTRACT: The width-fluctuation-corrected Hauser-Feshbach theory is used to derive a formula for calculating the double differential cross sections for particle emissions in the continuum region. There are two essential points. The first is how to handle the width fluctuation correction factor--for this we use the discretization method. The second is how to treat the continuum levels of the residual nucleus, and for this we use a statistical description. We take the neutron-induced inelastic scattering as an example, and calculate the spectra for given outgoing angles, the angular distributions and the spectra. All the calculated cross sections are found reasonable and consistent with each other.

9717

CSO: 4009/134

Optics

AUTHOR: ZHU Yayi [2612 0068 0001]  
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DU Yabin [2629 0068 1755]

ORG: All of the Laser Research Institute, Suzhou University

TITLE: "Experimental Measurement of Stray Light in Holographic Concave Grating Monochromators"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 7, 1984  
pp 577-581

TEXT OF ENGLISH ABSTRACT: This article deals with the resources of stray light in holographic concave grating monochromators. A new plan of measuring the stray light is suggested. The linear calibration on a large-order-scale is solved by using light intensity recursion, real environment calibration and a photon counting technique. The measuring limit of order  $10^{-12}$  is obtained under the condition of the photon counter sampling time of 1 second. This article introduces a new design idea for eliminating the error caused by the fluctuation of light source intensity and for improving the precision and accuracy of the experiment. Finally, the measurement results of the stray light in the monochromatic system of the Raman spectroscopic instrument designed and produced by our institute are given.

Optics

AUTHOR: XU Yuguang [1776 3022 0342]  
CHEN Shouhua [7115 1343 5478]  
RONG Zhonghua [2051 1813 5478]

ORG: All of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Ultrahigh-speed Photography of Interference Patterns and Shadowgraphs by Using Encoding Gratings"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 7, 1984 pp 600-606

TEXT OF ENGLISH ABSTRACT: A laser beam is split into several sub-beams, each of which has a different delay time and is encoded by using a grating placed in a different azimuth. After converging by means of a series of reflectors, these sub-beams become one beam again which is used to diagnose the object through holographic interference and holographic shadowgraph. When the hologram is decoded, a set of interference patterns or shadowgraphs corresponding to different moments can be obtained.

Optics

AUTHOR: CHEN Jianwen [7115 1696 2429]  
FU Shufen [0265 3219 5358]  
ZHANG Dake [1728 1129 0668]

ORG: All of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Free Electron Laser Using the Smith-Purcell Effect"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 7, 1984 pp 607-611

TEXT OF ENGLISH ABSTRACT: In this article, the principle of a free electron laser using the Smith-Purcell effect is discussed. The influence upon radiation of using a grating with variable space frequency is studied. The calculation shows that if such a grating is adopted and its operating parameters are selected adequately, the threshold value of pumping electric current intensity is expected to decrease and the radiation power will increase.

9717

CSO: 4009/20

**Physics**

AUTHOR: BAO Ximao [7637 1585 5399]  
LIU Chengen [2692 2110 1869]  
SHEN Honggen [3088 7703 2704]

ORG: Nanjing University

TITLE: "Transient Annealing of Boron-Implanted Silicon"

SOURCE: Nanjing NANJING DAXUE XUEBAO (ZIRAN KEXUE) [JOURNAL OF NANJING UNIVERSITY (NATURAL SCIENCES EDITION)] in Chinese No 2, 1984  
pp 227-231

TEXT OF ENGLISH ABSTRACT: Transient annealing of boron-implanted silicon was carried out with a graphite strip heater. The samples were studied in terms of Hall measurement, electron microscopy, ion microprobe analysis, and four-point probe measurement. The electrical properties obtained were comparable to those obtained by the conventional furnace annealing. They have negligible dopant redistribution and better crystalline structure. Therefore, transient annealing may be a very promising method.

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CSO: 4009/138

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